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Volume 1 Number 12 $2.95

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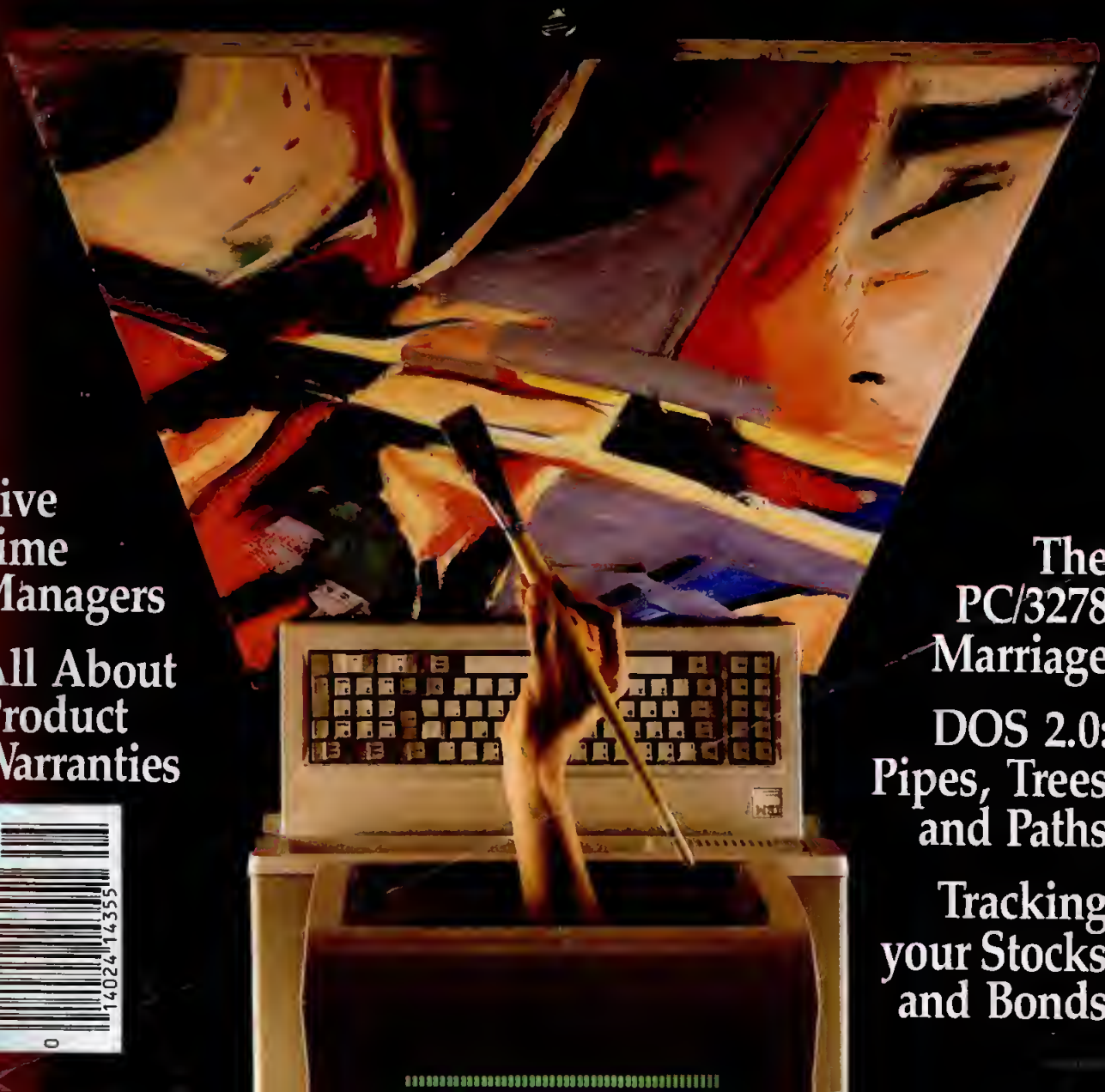

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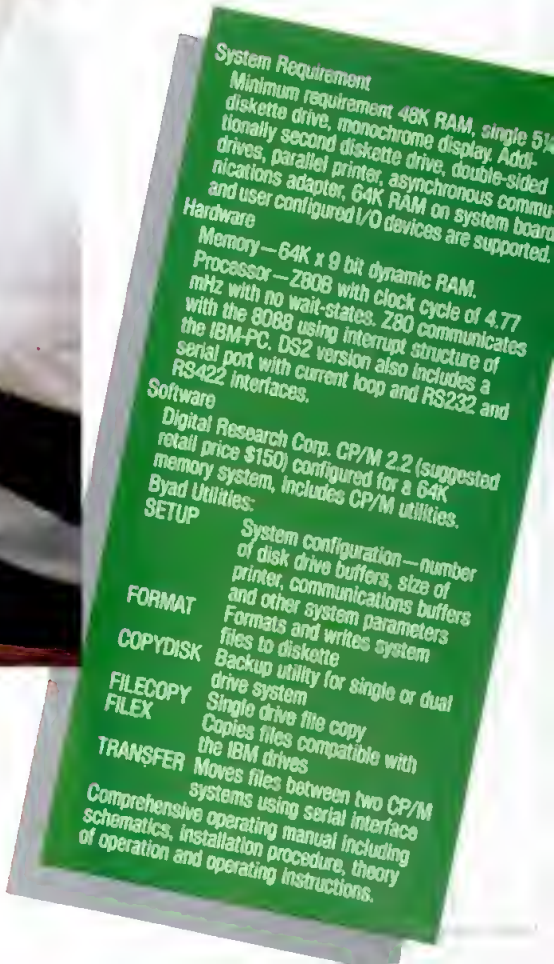

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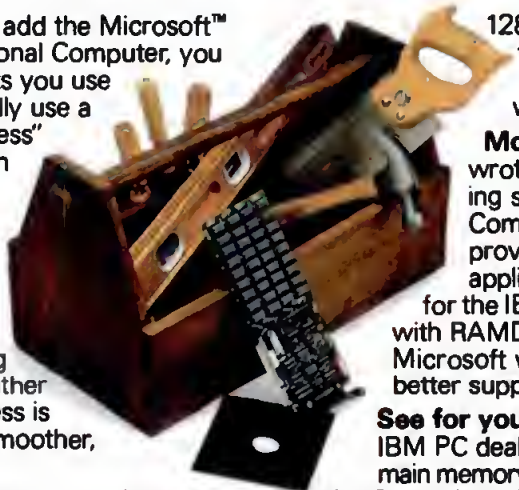

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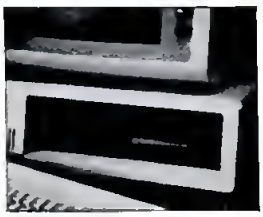

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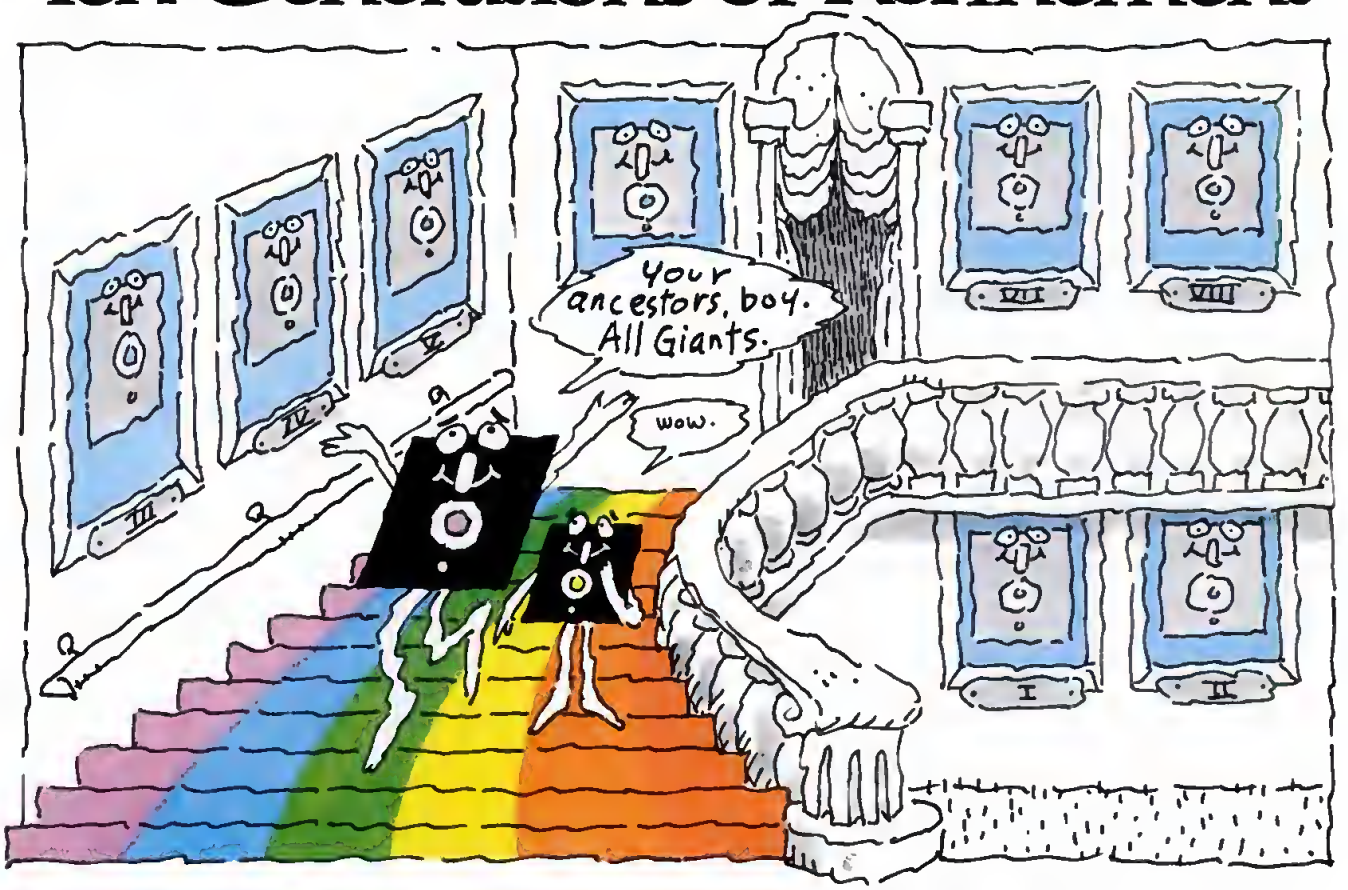

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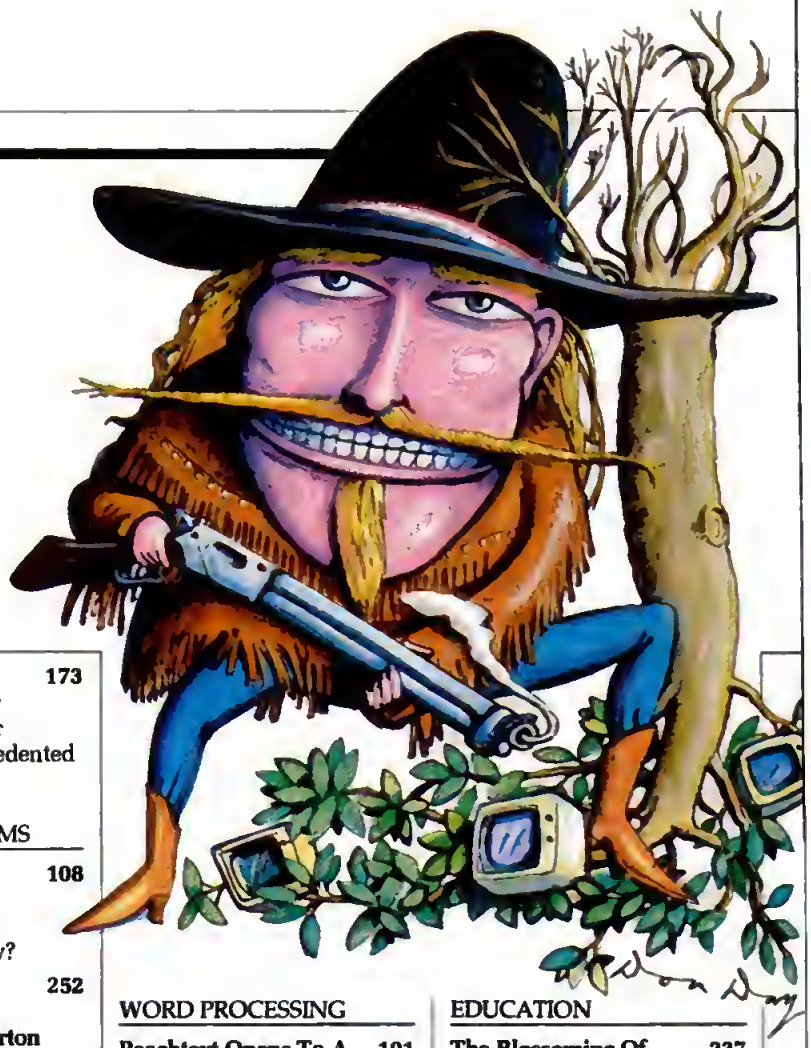

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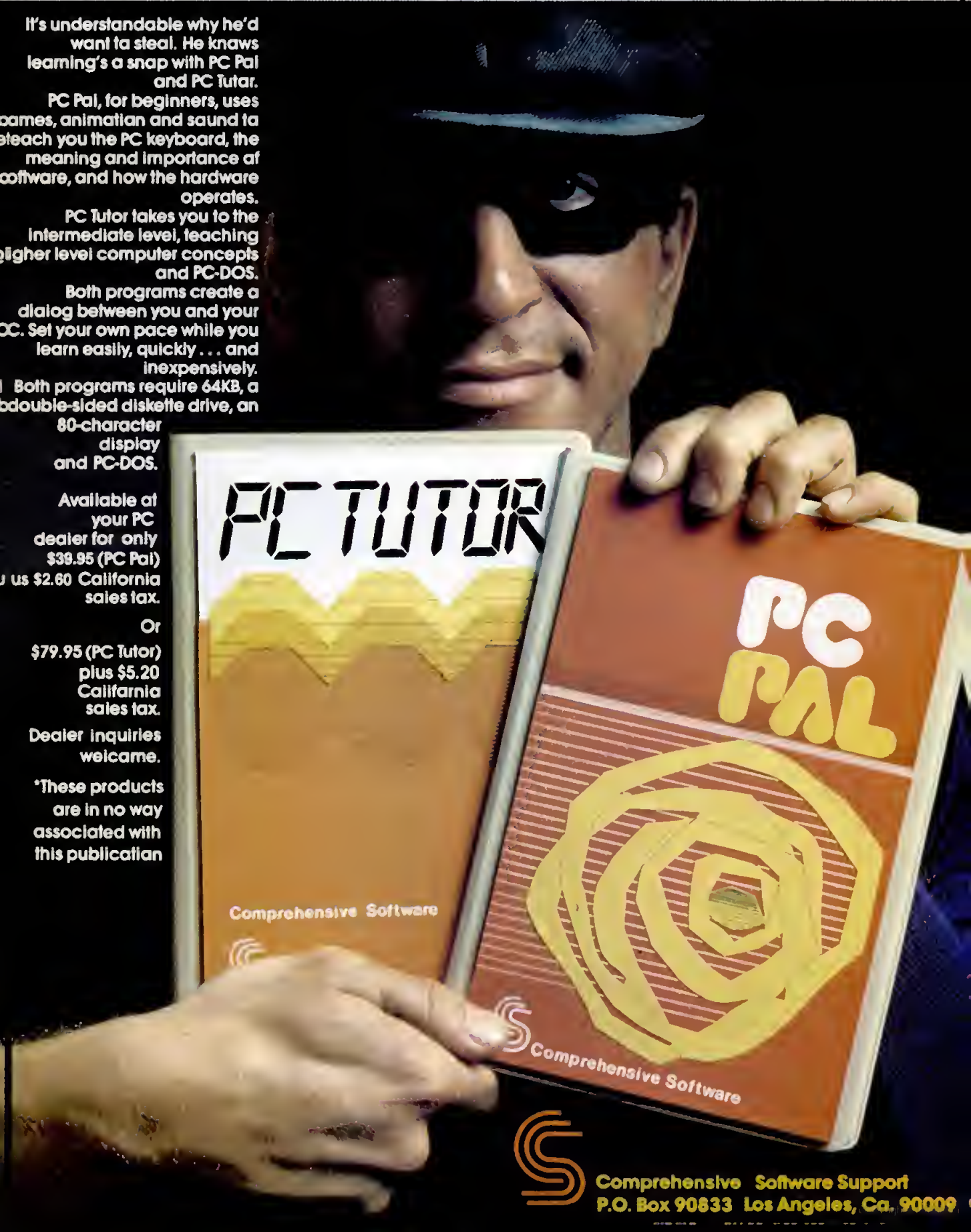

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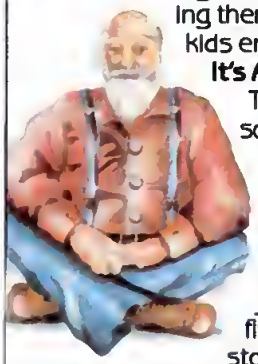

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If you're a parent who would rather see your kids reason with aliens than destroy them, you've got plenty of reasons to ask your local software retailer for IN SEARCH OF THE MOST AMAZING THING. It's compatible with Apple,® IBM,® Atari,® and Commodore 64™ computers. And it offers so much fun you'll probably be tempted to play it yourself. Or you can write us directly at: Spinnaker Software, 215 First Street, Cambridge, MA 02142.

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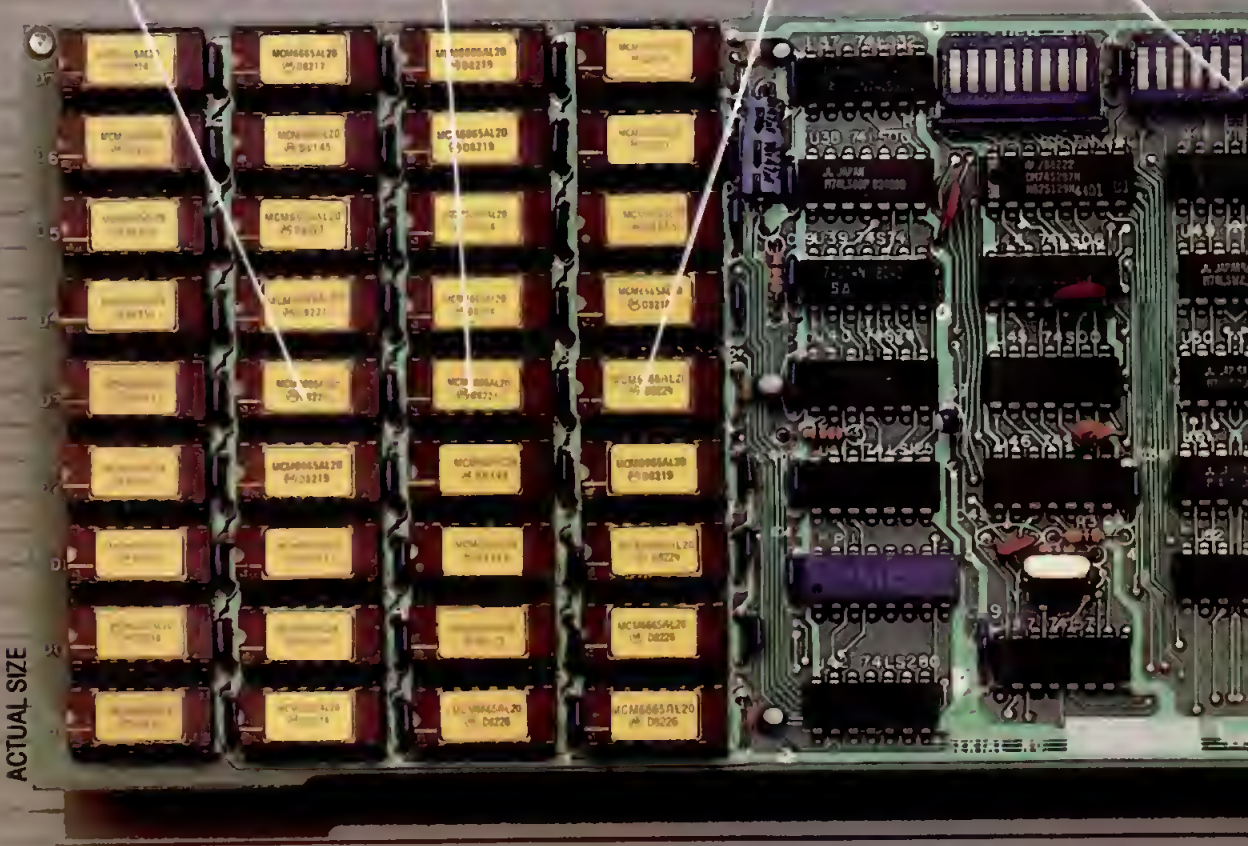

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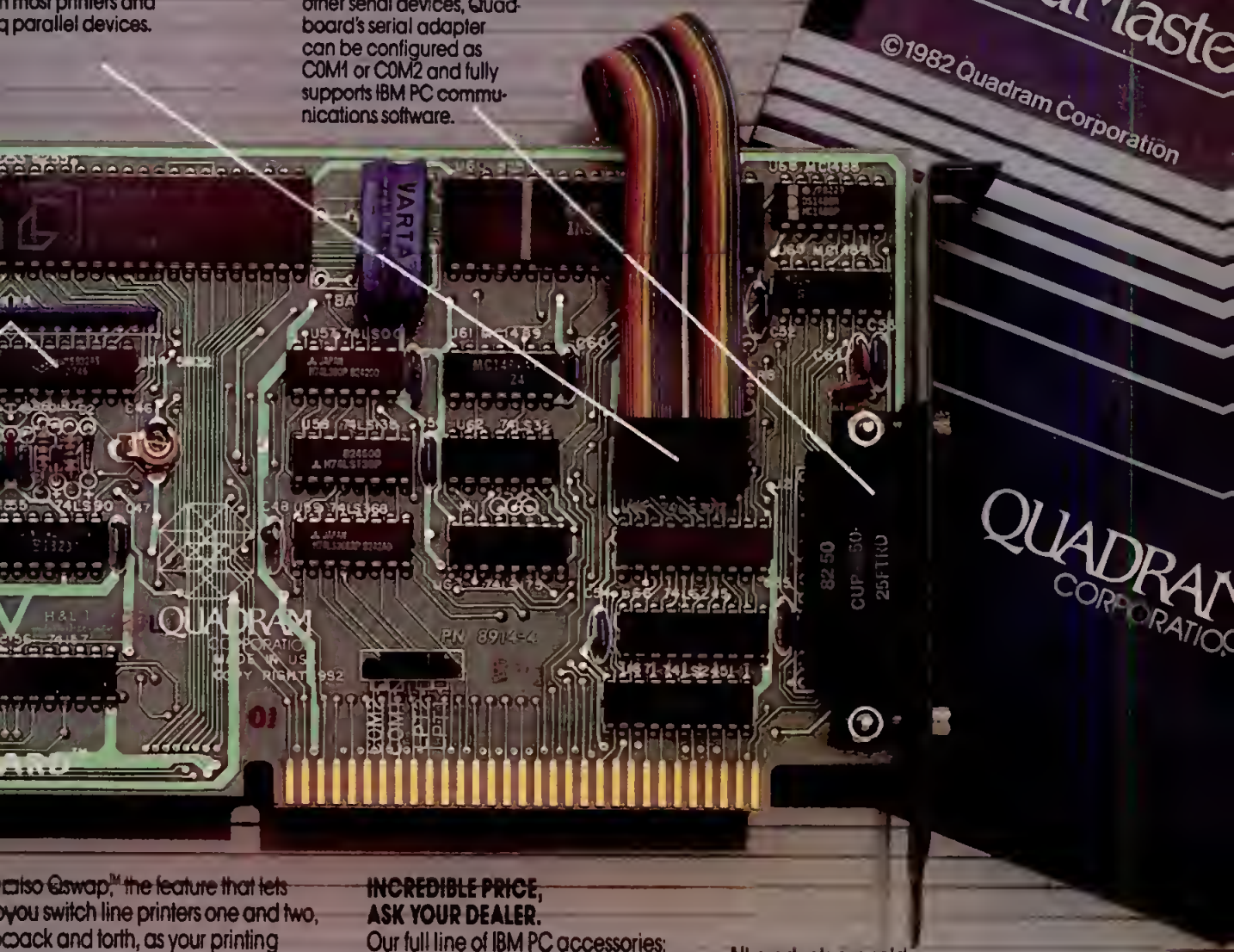

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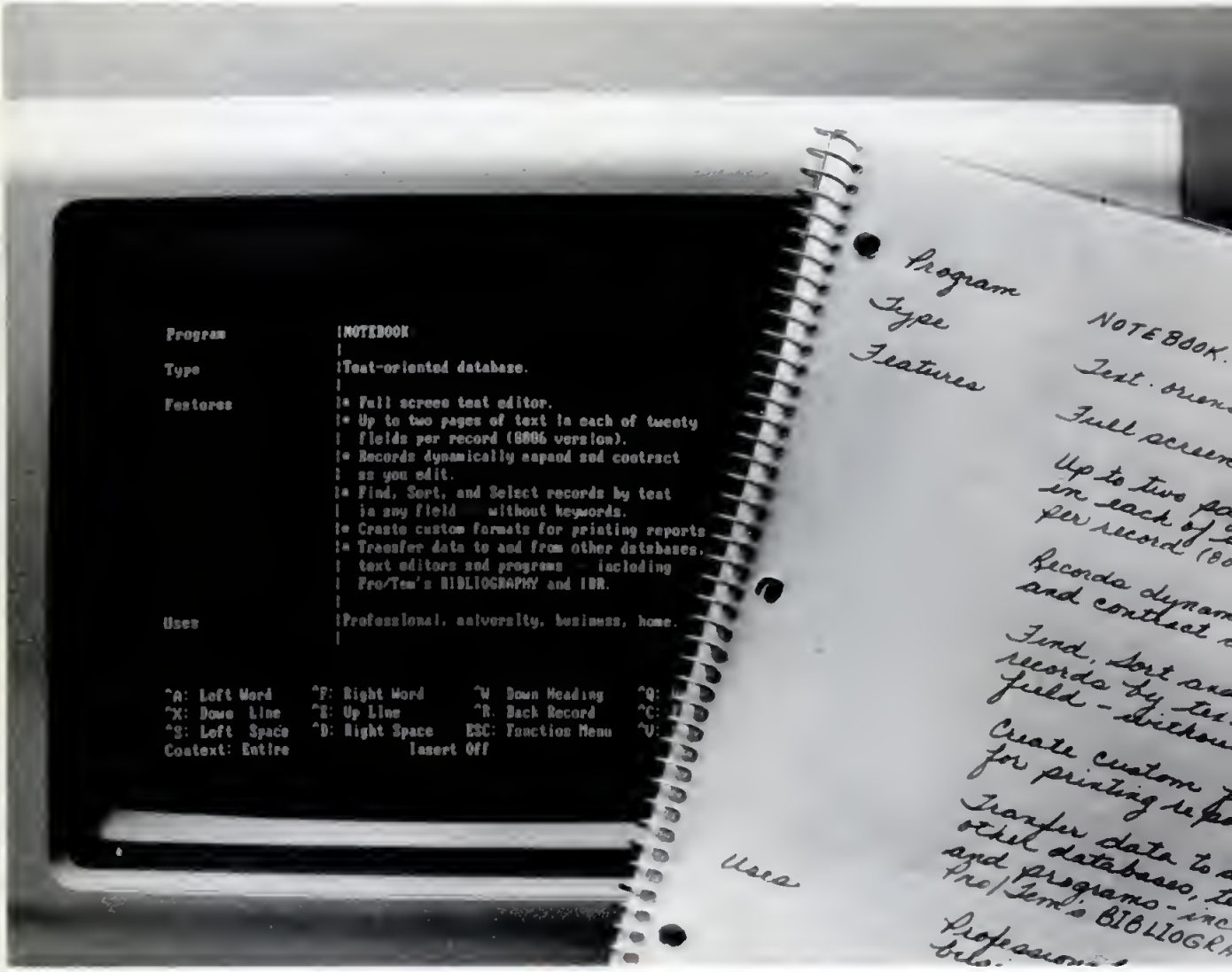

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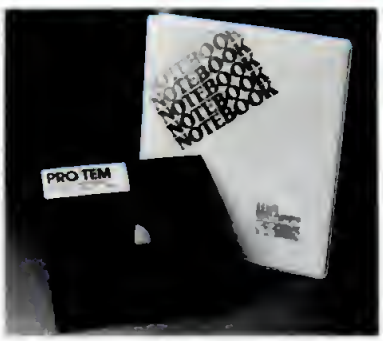

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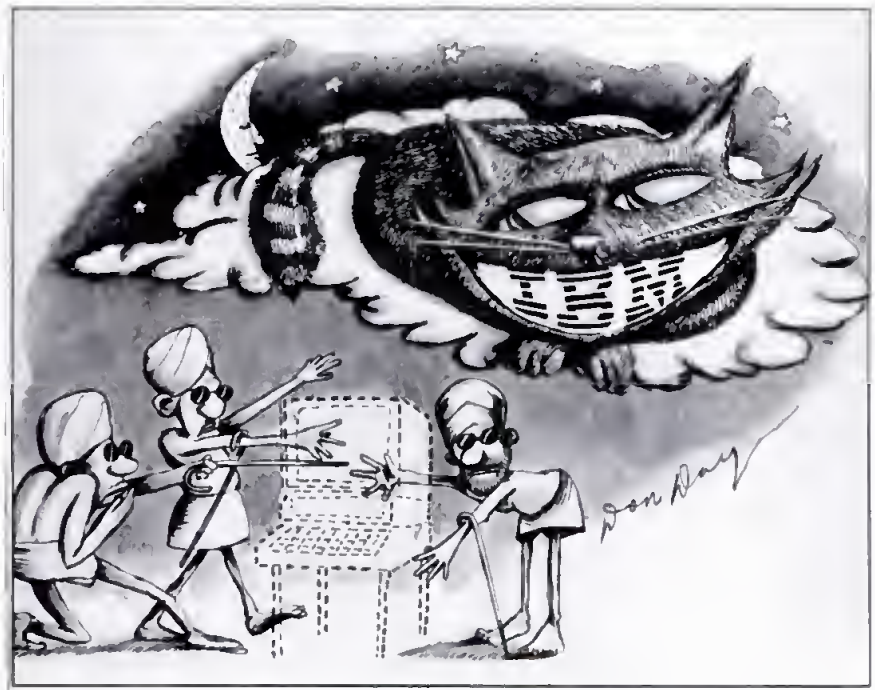
FROM THE EDITOR'S SCREEN/COREY SANDLER

If there's a rustling in the bushes, chances are, it's not a tap dancing elephant or even a silent Buddha. Then again, it could be . . .

The Computer That Came In From The Cold



Covering IBM is a bit like conducting e daily interview with e silent Buddhe. At midnight. Blindfolded.

Oh, of coursa there are occasional flashes of light here end there, and sometimes enough of a burst to catch a shadowy glimpsa of somathing or othar. Tha fact remains, however, that IBM can keep e secret until it is ready to turn on the lights. The people from Boce Raton by wey of Armonk could give the CIA end the KGB lessons in Security 101.

So it hes been in the last saveral months, as everybody knew thet Big Blue was about to announca its first expansion of the PC line. IBM presumably knaw, too, but tha lights were still out.

The situetion reminded me of the anciant Indien story of "The Blind Men and the Elaphent," immortelized in tha poam of the same name by John G. Saxe.

"The first epproached the elephant,
And, happaning to fall
Ageinst his broed and sturdy side,
At once began to bawl,
'God bless me! but the elephent
Is very lika e wall!' "

The second blind man feels tha tusk, so smooth and sharp, and decides thet tha elephant "Is very like a spaar!" Tha third man found the trunk and spake, "the elephant is vary lika a snake!" The fourth, e knee, which led him to think of e tree. The fifth, an ear, which he mistook for a fen. And the sixth, e swinging teil did grope, and decided in his wisdom it was a rope.

Well, we heve been in the eye of a hurricane of rumors here et PC lately. Hardly a day went by in Jenuery, February, and aarly March that some hot naw tip didn't errive. The Woll Street Journol ennounced the "Peenut" (e sceled-down, low-price PC for the masses) in Jenuary, which seemed to excite everybody but IBM. Several of the other magazines in the microcomputer field reed the entrails or sifted through the garbage and declared that

WE HAVE been in the eye of a hurricane of rumors here at PC lately.

"PC-2" was about to be upon us. This machine was to be a super business device, and everybody just knew that it would use a new microprocessor—the 80186, or was it the 80286, or perhaps "the 68000," as one pundit confidently declared.

And then there were the announcement dates. One worldly magazine went out on a limb and said that it was certain that IBM would release the PC-2, or was it the Peanut, at the CES show in January. Later, that same magazine "discovered" that IBM "never" announces anything at a show. One inside source at Big Blue (sources do exist, even though the tidbits they throw are mighty small) confided that the PR staff at CES was beseiged by reporters and buyers demanding to know why IBM had decided to hold back on its "promised" announcement.

In any case, we finally began to believe there was an elephant moving in the bushes when we unofficially discovered that IBM had scheduled a series of briefings for dealers in early March. Of course, the company would not confirm this, but we eventually received a heart-fluttering, stop-the-presses acknowledgement from a source deep within IBM (Deep Blue?) that something would happen on March 8 in New York. Coffee at 9:30 a.m., something at 10 a.m., we learned. We would receive a Mailgram on March 7 with the formal invitation, we were told.

Well, the Mailgram never arrived but we went to the Grand Hyatt Hotel in New York anyway. There was the coffee, and there was a coterie of IBM public relations people, and there, outside the closed doors of a rented conference room, stood a pair of broad-shouldered security guards. The something was inside, as were the press kits, so we talked about the weather

Outside the closed doors of a rented conference room stood a pair of broad-shouldered security guards.

(unseasonably fair) until exactly 10 a.m. when the doors were opened.

And the lights went on and the Buddha smiled and there was the PC-XT. Not the Peanut. Not the Popcorn. Not the PC-2.

"And so these men of Indostan
Disputed loud and long,
Each in his own opinion
Exceeding stiff and strong,
Though each was partly in the right,
And all were in the wrong!

So, oft in theologic wars
The disputants, I ween,
Rail on in utter ignorance
Of what each other mean,
And prate about an elephant
Not one of them has seen!"

* * *

Our cover stories this month turn away from the hardware and talk about some fascinating applications of the PC: Art for Art's sake, and art for business's sake.

And yes, you'll learn the full details of the PC-XT, along with an appraisal of DOS 2.0 and several other interesting developments from IBM. We won't keep you in the dark.

—Corey Sandler

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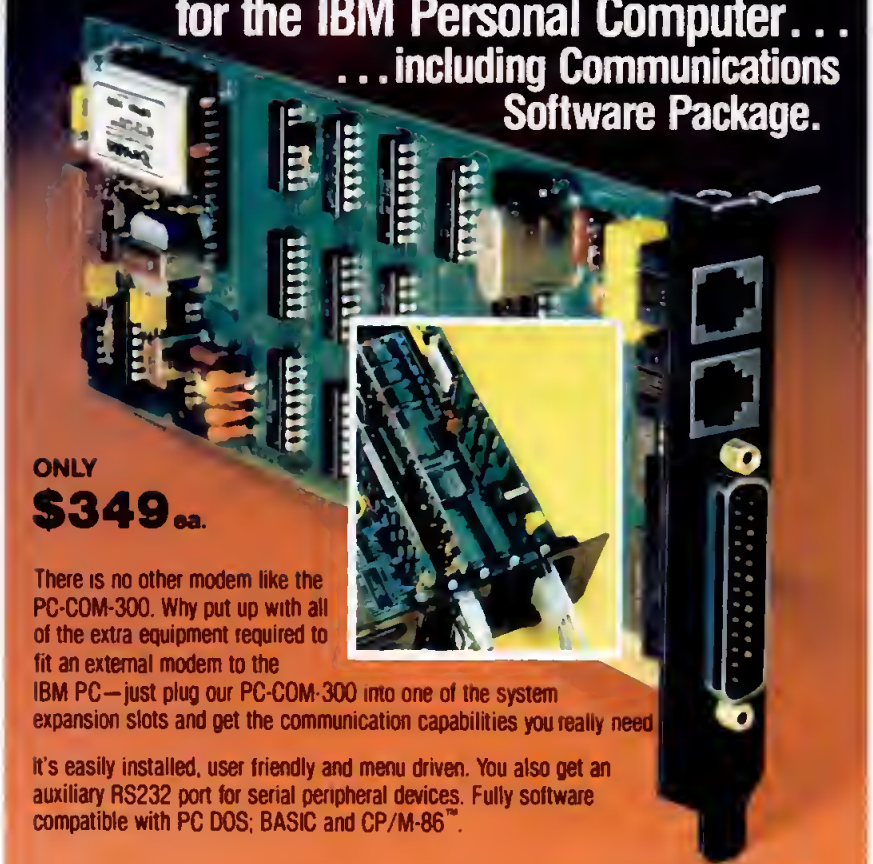

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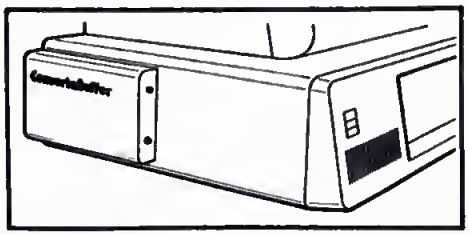
IT'S A BUFFER. Generating graphics requires the outputting of a large amount of data to the printer. ConvertaBuffer speeds this process by receiving the data as fast as your PC can send it — 1,000 characters per second; storing up to 64K bytes of data in its built-in memory buffer; and then sending it to the printer at the printer's slower speed — 25 to 55 characters per second. This allows you to go on to other work without having to wait for the printer to finish printing.

EASY TO INSTALL. ConvertaBuffer comes with its own built-in cables which plug directly into your PC's printer adaptor and your printer's cable without removing the cover of the system unit — there is no need to buy an extra cable. And, each unit has its own fully regulated DC power supply — the unit does not steal power from the PC or the printer.



ConvertaBuffer also features a convenient front panel switch which resets the buffer to abort the printer output if desired. And, the status light indicates when ConvertaBuffer automatically switches to the graphics mode.

HAVE YOUR CAKE AND EAT IT TOO! The parallel-to-parallel ConvertaBuffer for graphics is the latest member of the ConvertaBuffer family. The original ConvertaBuffer enables you to connect any RS-232C serial interface equipped printer directly into the parallel printer port of your PC with up to 32K bytes of printer buffering.

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von Leivendyke
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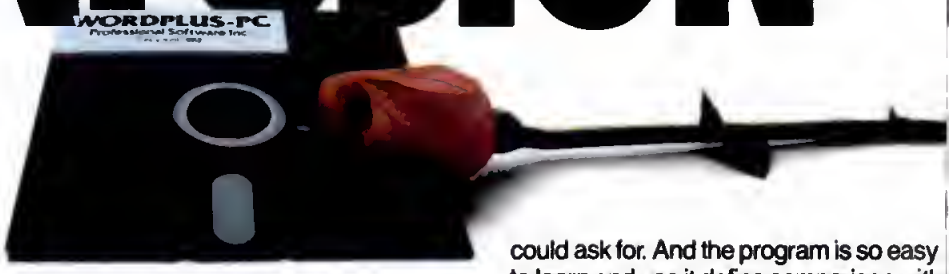
ANNOUNCING THE END OF WORD PROCESSOR CONFUSION



It's one confusing business, choosing a word processor. All those companies assuring you theirs is the most fantastic one of all. And leaving you to cut through all the smoke and hopefully whittle them down to the best one for you.

Well, we can help. If you'll just invest the next three minutes reading this, we'll tell you about a word processor that makes picking the right one a real breeze.

FIRST, A WARNING. There are two things you must do when evaluating any word processor. First, be careful. It's no secret that many of today's claims about being easy to learn and use just don't stand up to careful comparison. Watch carefully for complicated codes and programs that require "training sessions." Secondly, be selective. Buy a word processor you can use on a daily basis, not one that requires another "training session" when someone goes on vacation. In other words, be very careful to select the word processor that's absolutely the best and easiest to use. Which is what we'll now introduce you to.

WHY ONE WORD PROCESSOR MAKES THE MOST SENSE OF THEM ALL. Meet WordPlus-PC. It's the advanced, "user-oriented" software package that turns your IBM-PC computer into a word processor equipped with the sophisticated capabilities of far larger, more expensive systems.

THE REMARKABLE WORDPLUS-PC STORY. In a nutshell, it's this. WordPlus-PC was designed from the ground up to be the very latest in word processing technology. It has all the important features you could ask for. And the program is so easy to learn and use it defies comparison with other software.

HOW WE CAN BE SO SURE OF OURSELVES. We're Professional Software, a leader in word processing software with over 30,000 customers contentedly churning out letters and documents around the world on personal and business computer systems. We know precisely what a top quality word processor must do. And we've studied all the shortcomings of our competitors. That's how WordPlus-PC came to be the easiest-to-use word processor ever.

ALL THE FEATURES YOU'D EXPECT.

WordPlus-PC is both powerful and versatile. Its long list of major functions includes movement of paragraphs, global search-and-replace, and creation of multiple "boilerplate" and personal letters with the touch of a few buttons. There are 3-line headers and footers and automatic page numbering. When you underline or boldface words as you type, WordPlus-PC displays them in that form on the screen. You can merge information created by popular spread sheet programs. You'll create personal letters quickly and easily, or merge name and address information from other programs. You can easily create standard layouts for preprinted forms and use WordPlus-PC to prepare invoices or quotations. For large corporate customers, WordPlus-PC has the capability to merge information from files created by the firm's mini or mainframe computer. You can even type new documents while the system is printing other ones. And you'll find WordPlus fully compatible with virtually all popular ASCII letter-quality and dot matrix printers.

A BREEZE TO LEARN AND USE.

With WordPlus-PC's easy-to-use documentation, you'll be using your word processor right from the first minute. After an hour, you'll feel at home with all the basic functions and ready to explore the more sophisticated ones. After a few hours you'll put the manual away. There are never any complicated or confusing codes to memorize or look up. Rather, the screen's "message area" reminds you how to do what you want. WordPlus-PC's unique keyboard color coding makes things even easier. And whenever there's a question, simply press the HELP function to get back on track.

ALL THE HELP YOU NEED VIA TOLL-FREE PHONE. Learning something new goes best when you have encouragement, reassurance and answers to questions. That's how WordPlus-PC helps you learn. In addition to the help you'll get from your dealer, we're ready to assist you when you call our special toll-free number and talk to one of our carefully trained advisors. This service is available at no charge during the 90 days following receipt of your user registration card. It's all part of Professional Software's total commitment to customer service and support.

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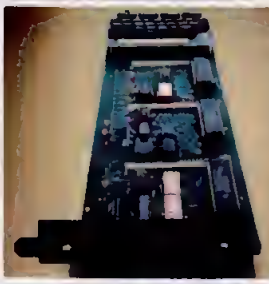

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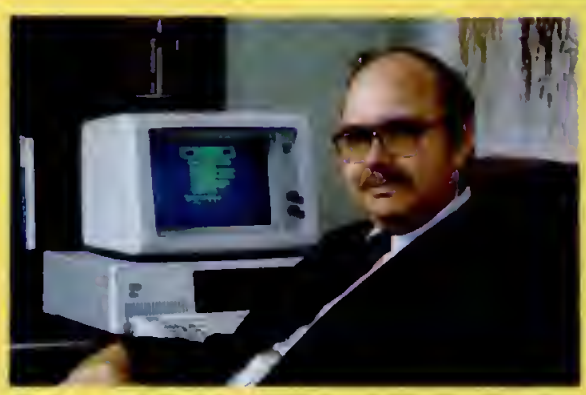

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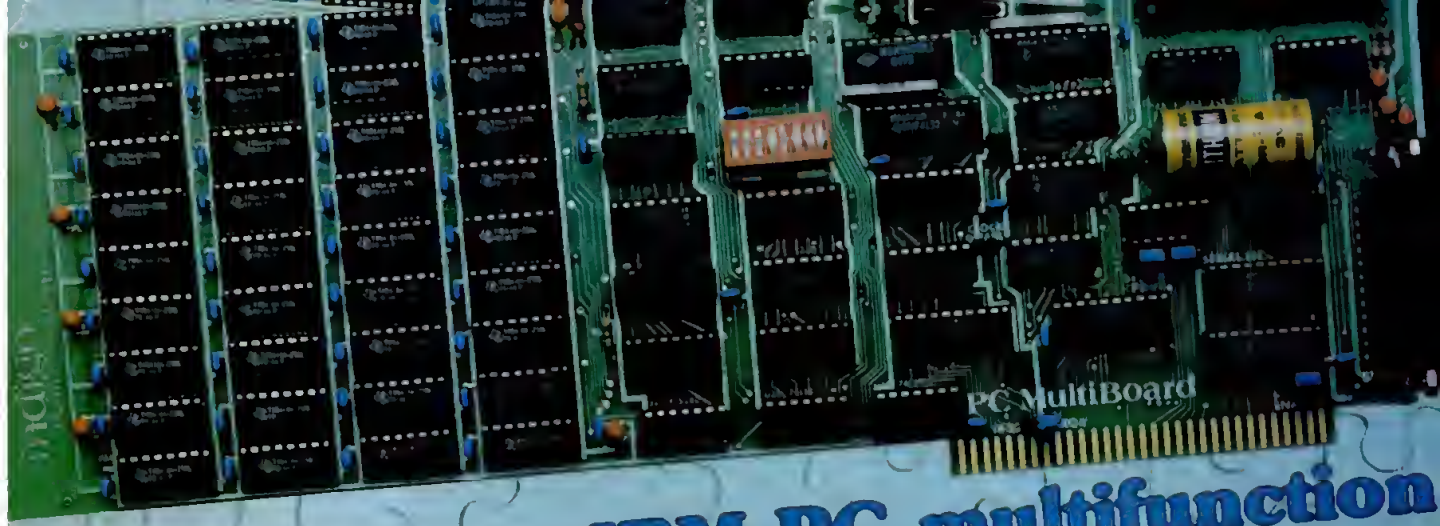

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Letters To PC

Designer Graphics

It would be a great help if you categorized graphics hardware, software and utilities under the following headings: Screen Graphics, Business Graphics, CADesign, CADrafting, Rendering, and Image Processing. I'm tired of searching through long lists of $2 pie chart programs to find one 3-D raster graphics program.

An architect or engineer uses many different kinds of graphics every day. We use PERT charts to schedule projects, charts and graphs to handle budgets, cartography to analyze city planning and site concerns, design drawings to formulate and analyze early plans, engineering drawings to communicate with contractors, and simulation to sell it all to the client and help him sell it to investors.

I'm disappointed that the computer industry has not yet perceived the sophistication and complexity of different graphic styles in common use. To computer vendors, it's all lumped in one bag as "graphics." This is conceptually the same as if architects lumped all the different kinds of computers together and called them "business machines."

Bob Davis
New York, New York

Thank you for your letter. We are planning a review of our subject headings,—"eyebrows" in the parlance of PC—and we'll consider your suggestion.—Ed.

Soft Sell

Until recently, I took a passive, almost disinterested view of the dispute concerning copy protection. I am now against copy protection, unless a single backup copy is allowed by the program. The following experience demonstrates the need for backup flexibility.

Novotron, by Verisoft Works in Arizona, comes without DOS installed, but with a tailored "install" file that simply instructs the user on how to install DOS version 1.1. In addition, an autoexec.bat file is included.

Because my Sony television image is off-center to the left, and because I have both monochrome and television hooked up to the system unit at the same time, I copied the mode file from DOS and the new switch file from the February issue of *Softalk* onto the Novotron disk. When I then tried to run the program, the message "error in EXE file" appeared. I could not determine the source of the problem and called Verisoft.

Verisoft's literature specifies that the program is copy-protected and that backup copies may be purchased for $7. However, the company's limited warranty states that if the program "fails to perform as Verisoft Words defines it should," it will fix the problem if they determine that there is a defect.

When I explained my procedures to the Verisoft representative over the phone, he stated that programmers build things into the program that make it glitch when other material is copied onto the program disk, that the resulting error in the program file was caused by my action, that Verisoft is not therefore responsible, and that I would have to send them $7 for a backup disk.

Verisoft was wrong in not warning about the problem in its literature. If I had been trying to make a copy of the program, its reaction would perhaps be understandable; however, I was not. I was merely attempting to make the program more usable.

Henceforth, I am only going to buy programs that are not copy-protected.

Joseph E. Russell
San Francisco, California

WP: A Mild Objection

Was there any point to the infantile whimperings committed by Clifford Barney ("User-Friendly Word Processors") in Volume 1 Number 7? If so, it eluded me—and Barney as well, I suspect.

I notice that Barney was unable to specify either (a) an example of his proposed standard, or (b) where, and to whom, the economic benefit—the key to standardization—would accrue. Barney's hysterics are typical of the kind of nonsense perpetrated by those with limited experience in either programming or business.

He noted, for example, that "the best word processors have been designed for newspapers." It is true that firms such as Atex have had great success designing systems and keyboards for that notoriously technophobic group, journalists. However, he should investigate the cost differential of that product before holding it up as a paragon of good design.

Barney might give some thought to two subjects: the relationships between

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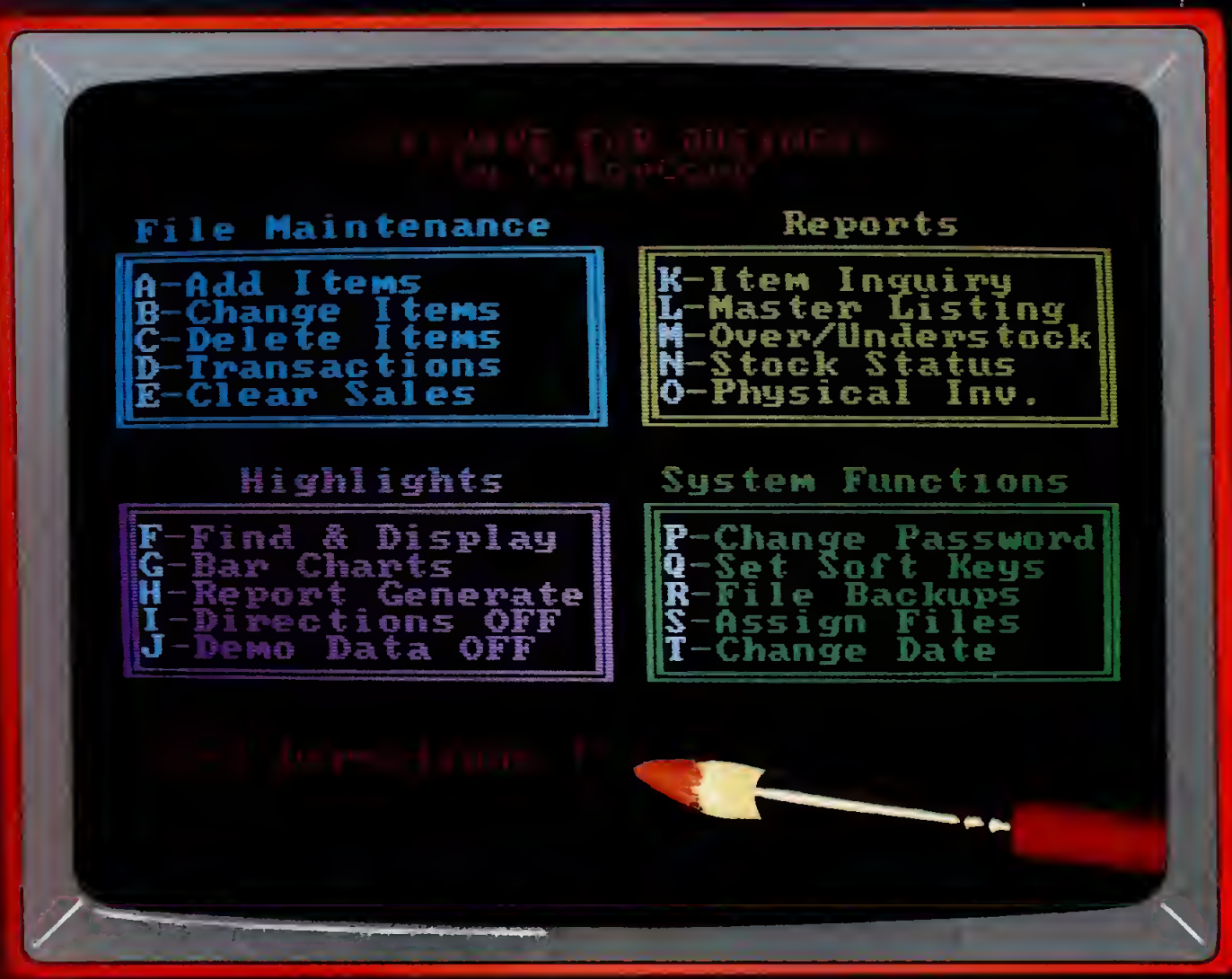

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Letters To PC

enormous flexibility of a tool and the burden that flexibility places on tha tools user, and the standard-satting end enforcing process.

Howard A. Karten
Randolph, Massachusatts

Clifford Barney replies:
If not octuolly technophobic, writers and ortists hove olwoys been notoriously indifferent to the costs of technology. I om sorry I offended Mr. Karten, but I think thot somedoy it will benefit someone economicolly to design o really good word processor for microcomputers. In the meantime, I hope I moy be forgiven for poking some fun ot the clumsy word processors we presently hove.

Attention SuperCalc Users

In your Volume 1 Number 9 "Letters to PC" column, a reader asked the question, "Is there a newsletter devoted to the SuperColc program?" The answer is yes.

It's *SuperNews*, the newslattar published quarterly by Sorcim Corporation, makers of the *SuperCalc* program. It contains helpful and easy to undarstand tips and snswers to questions people have regarding *SuperCalc*.

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Thanks for letting people know it's availsble.

Barbara L. Fainberg
Editor, *SuperNews*
San Josa, California

Free Offer

I read with interest your articles on communications (Volume 1 Number 9) and the software packages available for tha PC to maka it act like a terminal. I hava been offering, free, a terminal simulator especially dasigned for interfacing with UNIX systams.

The package is written in Pascal and Mscro, and requires version 1.0 of the *Asynchronous Communicotions* software from IBM. It supports full screen (via "termcap" entries), with tha ability to upload/download text files and output to the printer.

Also included are intarfscas for Pascal to control the screen and a set of macros to do "if-than-else," "repeat-until," and "do-while" constructs in essembly lenguege. Tha program handles 1200 baud with no characters being delayad in tha buffar.

I will gladly distribute this package to eny of your readars. They must send e floppy disk and s self-addressed, stamped envelope to 35 Dogwood Trail, Randolph, New Jersey 07869.

Jim Holtzman
Randolph, Naw Jersay

Volkswriter Bugs Him

I recantly purchased tha *Volkswriter* word processor, and I have found, in the 64K version, some bugs that showed up when the length of my output was two pages.

Tha Print option has e tarrible defect! This defect does not show up as long as you alternataly edit tha file and print it. What you cannot do is print the same file more than onca without parforming some other function between the Print commands.

I triad various ways of gatting around this problam without success. First I tried using another fila, which was a list of Print commands, to print the same fila neme. Only ona copy was printad. Next, instead of printing s fila from the disk, I triad tha N option, which prints the file being edited. In this way I could print the file more than once, but each time six lines were daleted from the beginning.

I called Lifetree Associates in California ebout the problem and received several suggestions (try this, try that), none of which worked. Then, because *Volkswriter* uses standard DOS format for the files, I wrote a routine in BASIC to print multiple copies. However, a word processor program should be able to print a file more than once!

All in all, I'm not too happy with the *Volkswriter* program.

Edward Medory
Poughkeepsie, New York

Games Gaffe

In the article on games (Volume 1 Number 8), the table of games has a shaded portion with double asterisks, but their meaning isn't explained. It is left to the readar to figure out that those are the games reviewed in datail later on. A footnote would be very helpful.

Jack C. Lee
Hyde Park, New York

The shoded portion does indicote the gomes we reviewed. The footnote was omitted inodvertently.—Ed.

A Toggle Tale

The IBM *Asynchronous Communications Support*, version 1.0, requires 64K, not 32K as George D. Hughes, Jr. states in his review (Volume 1 Number 9). He also fails to mention that this program actually consists of two programs: a BASIC superstructure, and an assembly language base program that provides the intarfece with the communications edepter. The assembly base program provides a 128 character transmit buffer and a 2K receiver buffer, and runs very fast.

With a few minor modifications to the BASIC program, I can toggle my printar on and off at will, easily call auto log-on sequences and phone numbers from the disk, and upload from and

Letters To PC

download to disk. Note that the COMM.BAS program provided on the PC-DOS disk, written totally in BASIC, can just barely keep up with 300-baud transmission, and adding a printer output step to this program will result in some XOFF/XON activity.

Contrary to what is indicated in the PC "Guide to Operations," the Scroll Lock key is not an inactive key. At absolute address, 417H is a byte indicating the status of several keys on the keyboard:

Bit # Function:

0 - when set indicates Right shift key pressed.
1 - when set indicates Left shift key pressed.
2 - when set indicates Ctrl key pressed.
3 - when set indicates Alt key pressed.
4 - this bit is toggled set or reset by pressing the Scroll Lock key!
5 - this bit is toggled by the Num Lock key.
6 - toggled by the Caps Lock key.
7 - toggled by the Ins key.

Although the Scroll Lock key is not commonly used except in conjunction with the Ctrl key, there is no technical reason why it can't be used by your application.

Jefferey Sutherland
Hammond, LA

Tacky, Tacky

Upon reading the first few pages of "CP/M-86 and MS-DOS: a Comparative Analysis" (Volume 1 Number 7), I thought the article was unjustifiably biased, with insufficient explanation of the author's preference of CP/M-86. At the end of the article, I learned that the author is employed by Digital Research.

I later noticed the article, "Concurrent CP/M-86" in Volume 1 Number 6. After reading first the superlative eye-catchers in bold print and then the first column, I started to wonder who the author was. However, no description or background was given.

I looked up the article in Volume 1 Number 7 and found that both articles had the same author! He is also the author of the CP/M-66 manual, and Volume 1 Number 6 doesn't mention this. I consider this extremely tacky, and it destroys PC's credibility.

Brian Sharpe
Ft. Collins, Colorado

We agree. The kind of conflict of interest you describe was an occasional practice of the past, and one we hove discontinued. We will, though, go to the experts for stories obout trends and products not directly reloted to their own companies.—Ed.

Wish Fulfillment

In the Wish List in Volume 1 Number 9, Stephen Van Gordon of Campbell, California asked for a user-friendly program for auctioneers. That we have. It uses 20 single stroke commands with menus for consignments, pre-sale (re-listing, cataloguing, etc.), selling, and revenue procedures. The *Auctioneer* really gives the PC a work-out. It's an action-packed program for a fast-moving business.

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Norman Fowler
Frontier Computer Systems
Calgary, Alberta

Thanks for the informotion. If anyone else can fulfill o Wish List request, we'll be hoppy to pass the news along to our readers.—Ed.

In Volume 1 Number 6, the Wish List contained a request for a graphics card allowing algebraic equations including super-subscripts to be displayed on a Hi-Res RGB monitor. It just so happens that I have been working on the problem for the past 6 months, and expect to complete a *Scientific Symbol Editor* with that capability soon.

It doesn't require a special graphics card, but does require 256K of memory and (currently) an IDS Prism or Microprism with additional character set chips. For more information, write to me at Queens University, Department of Mathematics and Statistics, Kingston, Ontario K7L 3N6 Canada.

I have a request for PC. I read the magazine primarily for the advertisements and product reviews. Magazines are the only way to find out about products for sale for the PC. Your magazine has grown to such a size that it is difficult for me to quickly find information about the sort of products I am interested in. I request that PC implement an extended Index to Advertisers, including listings by product name and by category as well as by company name (as you do currently).

I'll look forward to easier access to information in future issues of PC.

Lee-Jeff Bell
Kingston, Canada

Star Struck

I'm writing this by hand because my copy of *WordStar* is not functioning; I'm writing to you because you've had articles about *WordStar* in your last few issues.

To get an update of *WordStar*, I had to turn in my distribution copy of the program and then wait from December 14 to February 16 to get the update—which won't print. It sends my IBM PC into a complete lock-up that requires a reboot to escape from. Now I have to return the update to the dealer.

What does the update do? It's supposed to run under DOS 1.1, but it still has the same limited printer install program and no terminal install program. Therefore, the help leads, justification toggles, etc. must be reset from the default values. The documentation talks

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Letters To PC

about instelling WordStor under DOS-86. where the defaults can be changed, and the documentation gives a listing that can be used with a micro assembly program. Real helpful to the non-hecker who wants a convenient word-processing package.

The update features a more ominous copyright notice, and the same old junk such as using Function key 9 for end of file and 10 for beginning of file. At least the new documentation shows which key does what; the old documentetion had the functions for those keys reversed.

Sorry for the crossouts and misspellings. I tried to get SpellStar to read this, but no luck.

Tony Paze
Cambridge, Massachusetts

The PC Goes to Camp

I'm really intrigued by the computer camp article by Barbara Harvie (Volume 1 Number 8). Can you suggest some camps for the coming summer, specificelly for PC users? I have several friends interested in such camps for their children.

Gary Rickards
Kanses City, Missouri

When "Computer Comps" was being researched, the PC wos so new thot few computer comps, if ony, were devoted to it. Now, Barbara Horvie tells us that CompuComp, o choin with nine computer camps ocross the country, hos introduced the PC into its curriculum. For more informotion, write to CampuComp, 5764 Paradise Drive, #7, Corte Madera, Califarnia 94925.—Ed.

Chess Challenge

Whatever became of the geme of chess? After finally receiving my copy of PC Volume 1 Number 8 on the 26th of December, I cen truly say it was the first issue I was disappointed in. An entire issue devoted primarily to games, and not one chess program reviewed! I can't believe there are no chess programs adapted for the PC—or am I wrong?

However, overall I am very pleesed with PC, and it was a major factor in my choosing the IBM as my home computer.

Harvey J. Nelson
Tucson, Arizona

Pleose don't shoot the messenger! We were looking for o chess game for the PC to include, but there were none ovoilable ot the time. We hove since located one, ond we will run a review in an upcoming issue—Ed.

EasyWriter: Pro . . .

Does your staff have something against EasyWriter II? I notice that it is never mentioned in your reviews of word processors, while WordStar is discussed constantly. EosyWriter wasn't even mentioned in your feature on word processing programs (Volume 1 Number 7) and I can see no reeson, other then prejudice, to omit such a popular end widely-used program from an omnibus review. Before I bought EosyWriter I tried out WordStar and found it much less "friendly."

Paul Segel
Syracuse, New York

No, we haven't ignored EasyWriter II. You con look for o review in an upcoming issue. That product—which has already developed its own devoted following—come out too late to be included in our word processing issue.—Ed.

. . . And Con

IBM doesn't make many mistakes, but when it does, they are humdingers. Here's the latest on the EosyWriter fiasco.

Fortunately, I missed all the EosyWriter 1.0 troubles. Version 1.1 elmost convinced me that 1.0 had gotten e bum rap. Then I bought ProofReoder and, es

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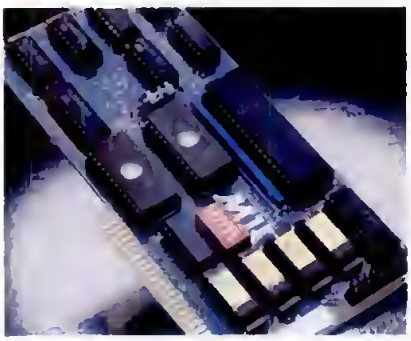

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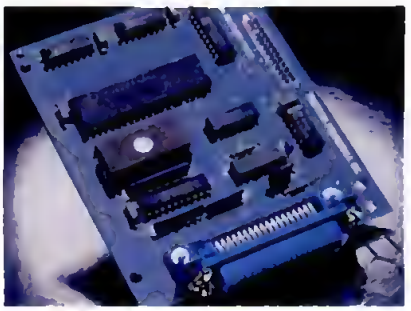

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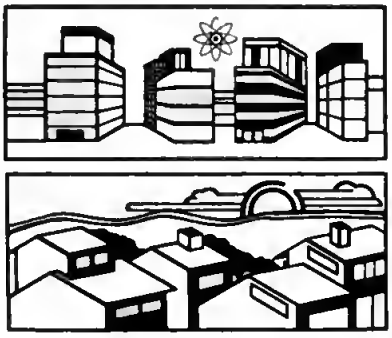

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Letters To PC

Aspen sensibly recommends, tried to add it to my EosyWriter 1.1 program disk. There's plenty of room for both on my 320K drives, end, as recommended in IBM's EosyWriter manual, I'd carefully formetted my only permitted copy to 320K.

Surprise! My copy hes only 160K. Why? Although it mey be totelly unnecessary end uncailed for, EosyWriter 1.1's backup.bat reformots the disk with e "format b:s/1"—forcing it to become a single-sided 160K disk.

There's not enough room for both in 160K. Surely the constent shuttling of the two disks will quickly wear out my one permitted copy of EosyWriter 1.1. (ProofReoder sensibly permits copies; all I'll be out when it's destroyed is the cost of a disk.)

IBM usually fixes its blunders, but when I took this one to my locel ComputerLand, IBM's dealer hotline told it, "No way."

Somewhere in IBM there must be someone who can see the justice of swepping my two fouled-up copies of EosyWriter 1.1 for copies that permit use of my full 320K.

Charles R. Bleir, Sr.
Townsend, Tennessee

A Call for Help

In "Speak To Me, PC!" (Volume 1 Numbar 8) Frank Derfler refers to Votrax Type 'N Toik, which he says is reviewed in thet issue. Help! I can't find the review. Please send directions.

Karen Heddad
Birminghem, Michigen

See "In the Beginning, The Word" by Dr. Larry Press in Volume 1 Number 9.—Ed.

Calling All Modems

I am diseppointed thet your megezine chose not to review modems that are optimized for the PC. Genereiized smert modem articles are a dime a dozen. When I subscribed to PC, I was hoping to get reviews of hardware and software that are optimized for the IBM PC.

There are at leest two companies advertising bus-connected modems in your peges et prices thet are competitive with the outboerd-mounted modems. Will you please review those in a future issue? I am elso tired of erticles thet are merely e discussion of product features. How about some more eveluetion of those products?

James E. Stecy
Syracuse, New York

PC runs both orticles thot are product descriptions and product reviews or evoluotions, depending upon the number of similor products ovoilable ond their complexity. As to your specific question obout modems thot mount outside the PC, you con expect reviews of those newer products in on upcoming issue.

And, by the woy, see the editor's coli for reviewers with specific areos of expertise ot the end of the letters section.—Ed.

Correction

The correct eddress for the New York Ameteur Computer Club ("Club News", Volume 1 Number 10, pege 360) is P.O. Box 106, Church Street Stetion, New York, New York 10008.

Readers . . .

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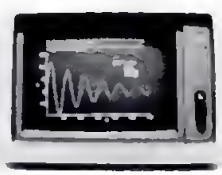

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CIRCLE 109 ON READER SERVICE CARD

A Modest Proposal

Many thanks for the service you continue to perform. "Letters to PC" is why I am e committed reader. I have e suggestion that, elthough it may mean temporary losses, would eventuelly guarantee even more readers, as well as more customers for the products advertised in *PC*.

Devote e section to a buyer's report or market report card. This would alleviete initial reservations about buying over the phone, as well as the frustration of unsatisfectory sales transactions. There might be several categories of eveluation. This would help lmprove the efficiency of every serious merchandiser.

John R. Schmidt
Cincinnati, Ohio

It's o wonderful ideo, but we thought of it first. Coming soon. . . . —Ed.

Back and FORTH

In Michael Ham's article, "Quest for the Ideal Language" (Volume 1 Number 10), he remarks, "Some will say FORTH's names for the elemental operations are terse lf not arbitrary. True, I can't defend @ for store and ! for fetch." Ham is quite correct. He cannot defend this, especially since @ represents *fetch* and ! represents *store*!

Paul A. Fishwick
Newport News, Virginie

You ore obsolutely correct, according to editor Ston Veit.—Ed.

User Group Listings

I'm looking into computer clubs in my area, end I heard that *PC* Volume 1 Number 10 listed such clubs. Could you send me e copy? I'd appreciete it.

Paul F. Gunberg
Augusta, New Jersey

We receive many letters requesting copies of our User Group list. An updoted list oppears in this month's Club News column, ond we'll be updoting and printing the list periodicolly.—Ed.

Just the Beginning

While reeding PC-Communiques in Volume 1 Number 9, I encountered en entry questioning how long it would be before IBM allows e PC to participete in e dis-

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CIRCLE 131 ON READER SERVICE CARD

Letters To PC

tributed processing network, switching between PC mode and CICS, IMS, TSO, etc.

Funny you should mention this. Earliar on that same day, I was given e presentation by IBM demonstrating this capability. A PC was connected (vie e Twinax interface) to an IBM 5520 text processing machine, which was in turn communicating with an IBM mainframe. The PC could run stand-alone, or ect as a terminal to the 5520, or run as e 3278 CRT to the mainframe with the 5520 performing a passthrough function.

Certain vendors, such as AST Research and American Business Machines, are currently offering 3270 emuletion in either Bisync or SDLC modes, thereby providing similar capabilities.

All indications are that this is only the beginning. Soon there will be e plathora of interfaces for tha PC to support attachment to systems up and down tha IBM product line.

Ron Halyshyn
Washington, D.C.

IBM announced just such an adoptotion to the 3278 in March. See "Making The Connection-Dato Processing With The PC" in this issue.—Ed.

Voice Synthesis: Second Thoughts

In response to "In The Beginning: The Word" (Volume 1 Number 9), by Dr. Larry Press, several points are in need of clarification and expansion.

It is true that voice interactive technology is playing an increasing roie in our daily lives. Applications of voice synthesis systems for the handicapped, in aircraft cockpits, and in telecommunications are of value from a user, system performance, and cost perspective. On the other hand, applications of voice synthesis in automobiles, vending machines, cash registers, and bousebold appliances are of questionable valua and a product of industry's naad to always provide the latest gimmick to enamor more customers.

Dr. Press paints an unnecessarily bleak picture of voice recognition technology as it currently exists. Though his finai statement that "the user will be able to sit down and hold an intelligent conversation with a personal computer" is ovarly optimistic, successful application of voica recognizers is currently being made.

For axample, the postal service and several airlines are using voice recognizers for baggage and parcel sorting. In addition, the use of voice recognizers for the handicapped is being explored at research centers such as Stanford University. NASA, the Air Force, and the Navy are currently testing voice recognizers in laboratory settings and also in such high noise environments as belicopters and high performance jet aircraft with some success.

Voice recognition technology will continua to improve, but current recognizers, especially of the isolated word-speaker-dependent kind can be successfully used given that the system designer carefully selects tha vocabulary and dialogua to maximize recognizer performance. PC owners wishing to consider voice recognizers should examine those manufectured by VOTAN (Fremont, California), interstate Electronics (Anaheim, California), and Scott Instruments (Denton, Texas), to nama a few.

Research to halp us decida how to interact with our increasingly common computar-based systems is under wey. Misappiying new technologies by rushing to include them in every conceiveble system can only serve to alienata the users of those systems and make the acceptance of the new technologies more difficult wban appropriate applications are found.

Markku T. Hakkinen
Blacksburg, Virginia
Helen T. Sullivan
Christiansburg, Virginia

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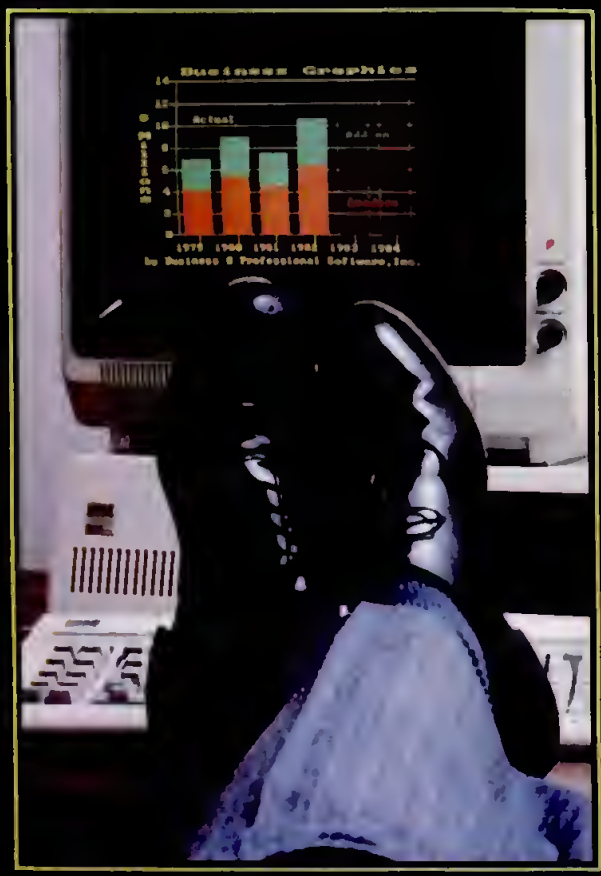

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CIRCLE 157 ON READER SERVICE CARD

How to get your fi

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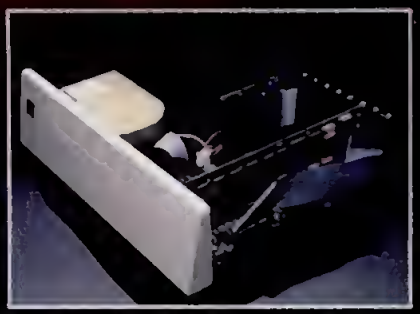

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CIRCLE 451 ON READER SERVICE CARD

PC-Communiques

A compendium of facts, news, opinions, gossip, inside intelligence speculation, and forecasts about IBM Personal Computers.

Busy Bootin'?

Is your paramour playing second fiddle to your PC? Bluesman Kokomo Arnold apparently experienced the problem firsthand. He even wrote a song about it, In which he minces no words:

Busy bootin' and you can't come in,
Busy bootin' and you con't come in,
Busy bootin' and you can't come in—
Come back tomorrow night and try it again.

Arnold admits his ettitude can lead to violence:
Don't you remember last Fridoy night?
You got out in the street and you wanted to fight.
But he remains unrepentant about his attachment to his machine. "I'm busy bootin'! Can't come in!" he cries as the music fades down.

Contributing Editor Steve Manes points out that Arnold's tune is particularly prophetic since it dates from 1935, when the only available digital computers were the ones that remain most popular worldwide—the five fingers of each hand.

Arnold's dexterity with those fingers on bottleneck guitar can be heard oo LP *Kokomo Arnold & Cosey Bill Weldon*, $8.95 from Yazoo Records, 245 Waverly Place, New York 10014. The record—Yazoo 1049—iocludes "Busy Bootin' " along with 13 other selections from the thirties, including Arnoid's prescient ode to the iBM keyboard, "Feels So Good," and Weldon's instructive ditty about running a monochrome display from the color/graphics adapter, "You Shouldn't Do That."

Fieldguides to PC Software

More releases from MicroInformation Publishing (MIP): The Minneapolis-based book house has announced three new issues about software for the iBM PC.

The IBM *Softwore* Guide ond *Handbook* will list over 160 programs. Programs are organized by 65 categories and have been rated on a 1 to 100 scale by 30 researchers. These retings are based on such factors as ease of use, reliability, error trapping, documentation, and cost effectiveness. The book will retail for $19.95.

MIP's other two books ere spinolfs from the above volume. *The Business Guide To The IBM PC* and *Word Processing Software For The IBM PC* will sell for $14.95 each. The publisher can be contacted at (612) 447-6959.

Can You Keep a Secret?

How much secrecy about a new product is too much? IBM may have found out recently—especially if anyone at Big Blue noticed an edvertisement that Datel, the New York computer emporium, placed in the *New York Times* last month.

Nearly a week after the PC-XT was announced to the public, and more than a week after IBM dealers found out about it, the *Times* ran a Datel ad heralding the arrival of "the second IBM personal computer." Above this caption was an illustration showing an eager audience watching a PC-like monitor suspeoded before them.

According to the copy, "few sequels live up to the original version." But the second Generatloo Personal Computer is, "impossible as it may sound, better than the original. More memory, more power, and an optional monitor that displays in living color." It concluded, ". . . hurry down to your nearest Datel store. Popcorn will be served."

It seems clear that the ad was composed before the announcemeot of the XT, in the days when the microcomputer world knew only that something was afoot at iBM. Datei, perhaps trying to get a headstart but unable to penetrate IBM's veil of secrecy, took a gamble. Only a small gamble, though—the ad was phrased so vaguely that Detel couldn't fali flat on its face even if it was wrong ebout Popcorn.

Our calls to Datel elicited no further information, but it may be indicative of the ensuing confusion that one employee called the new model the "PC Personal."

Illustrations Stuart Bradford

PC-Communiques

"THOSE OF YOU WHO HAVE worked with IBM personal computers will notice that they look remarkably alike. . . . The XT represents a significant extension of the performance range and storage capacity of IBM's personal computer line."

Douglas R. LeGrande,
Entry Systems Business Unit

Growth Projections

Just about everyone knows that the microcomputer industry is expanding like an expioding star. And most observers assume that the ectivity will levei off or at ieast become more concentrated in the next few years as hardware end software manufacturers "shakeout" of the industry. But until recently, there's been iittle quantitative data to support widely held assumptions.

In March, Arthur D. Little, Inc., the international research and management consulting firm, released results of its survey of the microcomputer market. The company counted 150 manufacturers "scrambling" for a piece of tha $3.5 biiiioo market. It predicted that annual sales would increase to $12-15 billion in 5 years.

Currently, microcomputers account for 8 percent of the $45 billion spent in 1982 in the U.S. on all computer-based products, including software. Arthur D. Little estimates that by 1987, the microcomputer share of the total market will grow to 12 percent.

Meanwhiie, Future Computing, a consulting firm, reported that market share for the IBM PC (as measured by factory value) grew more than tenfold from 1.9 percent in 1981 to 21 percent projected for 1983. Over the same period, Radio Shack's shared slipped from 20 to 16 percent; Appie's slice wes cut from 17 to 13 percent; end a company named "Other" dropped from 61 to 50 percent.

The Serial Boxes

For those of you who are pleying the greet IBM PC seriei number sweepstakes, here are some new entries:

The PC-XT unveiled to the press on March 8 in New York City bore serial number 00003516.

The new 5153 color monitor for the PC bore serial number 002071. We're off end counting.

Good News, Bad News

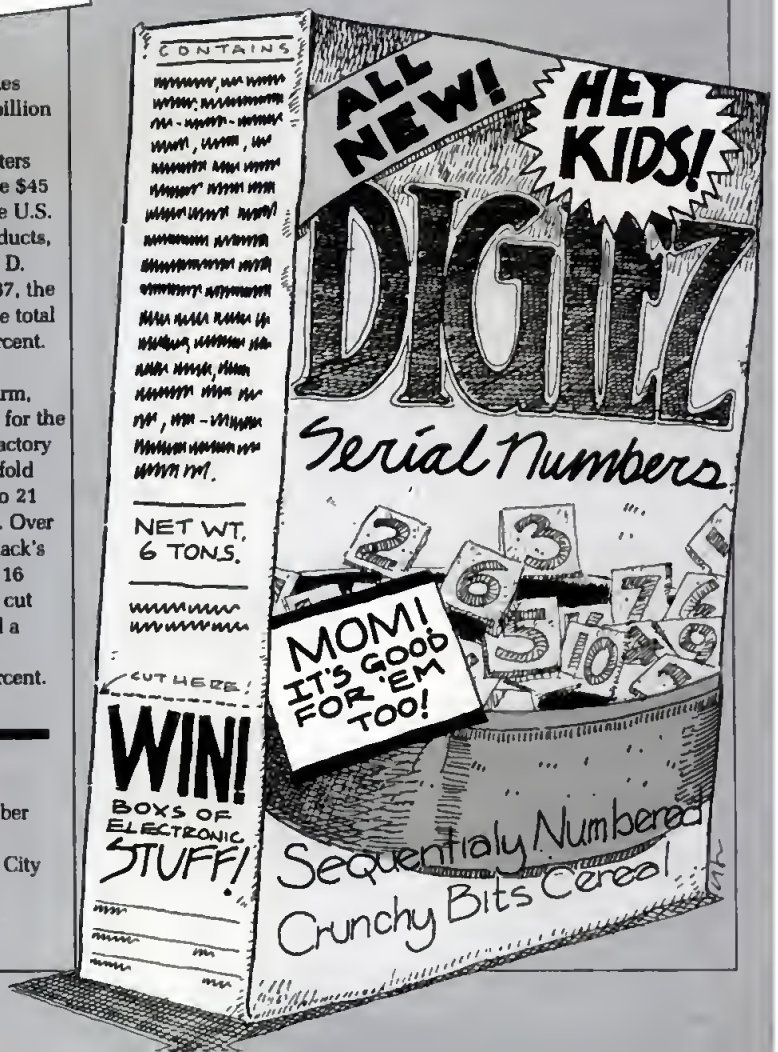
The New York Amateur Computing Club (NYACC) ennounced thet 20 volumes in its series of "freeware" ere available for the iBM PC.

Until now, this mass of public domain softwere hed only been avaiiable from CP/M user group iibraries. They were originelly designed to run on 8-bit microprocessors.

No longer. The new series of disks offers programs designed to run under PC DOS, including programs written in BASiC. They wiii now run on iBM PCs, but—the bad news—only on those mschines equipped with an sdd-on board from the 8080 or Z80 family.

The iast catch renders freeware far from cheap for most PC users. Add-on boards, such as Baby Biue, can cost severel hundred dollars.

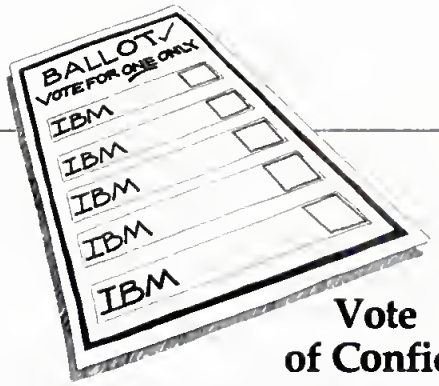
Recycled programs such es these are not likely to use many of the IBM machine's cepebilities—if they're able to run et ell.



Silicon Alley

During the press conference in New York at which IBM announced the new PC-XT, a company representative flashed an example of a color graphics chart on a large color video screen. (The oversized screen, by the way, was made by a well-known Jepanese electronics firm whose name begins with SO and ends with NY.)

While the demonstrator went on talking, our sharp-eyed reporter in the front row read the copy on the display, "Boca Lanes Bowling Scores," said Carl Lunden bowled a 211, Jed Perlowin a 210, and D.C. Thorson and Jerry Heald each toted up e score of 202. Who are these gentlemen? We're told they're programmers and technicians at IBM Boca Raton. And you thought all those IBM folk thought about were ROMs, RAMs and EPROMs!



Vote of Confidence

A Boston-area IBM PC user group conducted a poll of its members in February. IBM should be happy to hear that of the club's 800 members, only 12 had ever experienced hardware problems with their PCs. Few things in life have a batting average of 985.

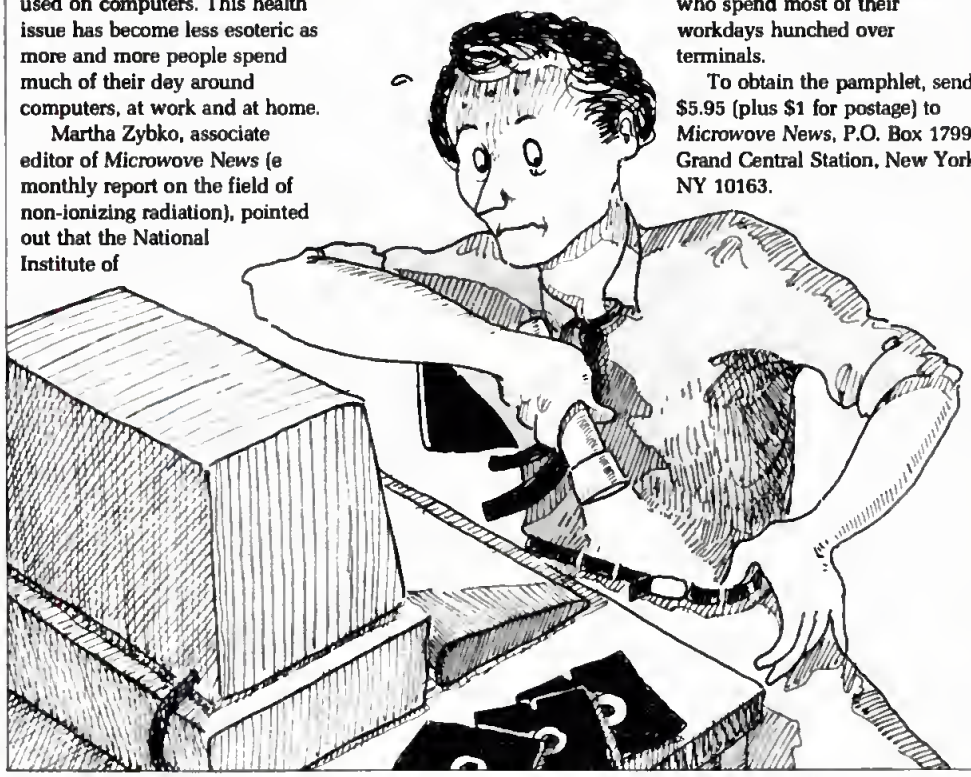
Can VDTs Make You Sterile?

Over the past year, e debate has raged over the issue of reproductive problems that mey be caused by exposure to the video display terminals (VDTs) used on computers. This health issue has become less esoteric as more and more people spend much of their dey around computers, at work and at home.

Martha Zybko, associate editor of *Microwove News* (e monthly report on the field of non-ionizing radiation), pointed out that the National Institute of Occupational Safety and Health (NIOSH) assures that there is no danger from exposure to VDTs. At the same time, NIOSH plans to launch a retrospective study on over 5,000 office workers. The study will focus on the effects, if any, of VDTs on reproduction.

Microwove News recently published an 86-page collection called "Video Display Terminals: Health and Safety," containing excerpts of articles on this subject. In eddition to the reproduction question, this pamphlet eddresses other ergonomic issues raised by the growing number of employees who spend most of their workdays hunched over terminals.

To obtain the pamphlet, send $5.95 (plus $1 for postage) to *Microwove News*, P.O. Box 1799, Grand Central Station, New York, NY 10163.



Make Mine Pepperoni

Just when you thought there was enough data in the world, somebody found a new question to ask.

Kamstra Communications, a St. Paul, Minnesota advertising firm, conducted a survey at last year's Applefest in Minneapolis. The typical user-on-the-street was asked a series of questions about personal computers—typical market survey material.

The final question, however, was not so predictable: What type of pizza do you crave?

Kamstra's experts were baffled by a powerful trend in the answers to this question—75 percent of IBM PC users proved to have a passion for pepperoni pizza. Less than half of the Apple owners shared that taste.

Marketing Research Director Dan Burke interpreted these results and offered the following recommendations. "Either IBM computer salespeople should seek out pepperoni lovers as potential clients. Or pizza parlors could exploit a vast, untapped market for pepperoni pizza by luring IBM computer users within sniffing distance of their product."

PC-Communiques

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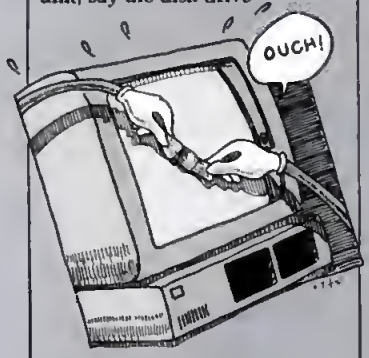
A Tramp Abroad

Before IBM could unleash its PC advertising blitz based around Charlie Chaplin the rights to tha little tramp had to be cleared through Chaplin's estete. Its offices are based in Switzerland under the neme of Bubbles, Ltd. IBM now holds exclusive, long-term rights to usa the little man with the bowler hat—but only for computer-related promotions.

First Aid for the PC

Soon there mey be a new wey to avoid waiting while your PC is shipped to end from a repair center when it's on the fritz. IBM is considering a system that would enable users to diagnose malfunctions and replece parts themselves.

The "Machine Element Replecement Program," as it is provisionally named, would allow you to isolate an improper unit, say the disk drive



controller, and perform a diagnostic check. If necessary, you would remove the faulty unit, take it to a repair center for replacement, and come home to install the unit yourself.

Citric Intelligence

Along with IBM PCs end vacation suntans, the stata of Florida produces much of this country's citrus fruit end sugar cane. As a friendly gesture to its neighboring industries, IBM has loaned seven PCs to tha University of Florida's Instituta of Food and Agricultural Sciences in Gainesville.

IBM also has sponsored a $100,000 grant to be used over tha next two and one-half years. The fund will be applied toward devalopment of software to essist in the production of Floride's specialty crops and to teach budding agricultural students how to use the PC in their work.

Tha agricultural department has also organized e series of traveling computer shows for Florida's farming regions. These shows demonstrate how microcomputers can be used productively down on the farm.

"Tha iBM PC always ettracts the biggest crowd at these shows," according to a university spokesman. This rural interest in the PC is a bit surprising because, et present, much more agricultural software has been harvested for the Apple end Radio Shack computers. Programs dedicated to counting corn rows and enalysing cow-to-calf ratios are just starting to come to market for the IBM PC.

IBM has a major stake in luring Floride's present and future farmers. A recent study by tha University of Illinois and the Arthur Anderson Company predicted thet 75 percent of large commercial farms (those with revenues of at least $100,000 per year) will be using microcomputers by 1993. These figures will translate into lots of dollars for the company that can best rope end hog-tie this market.

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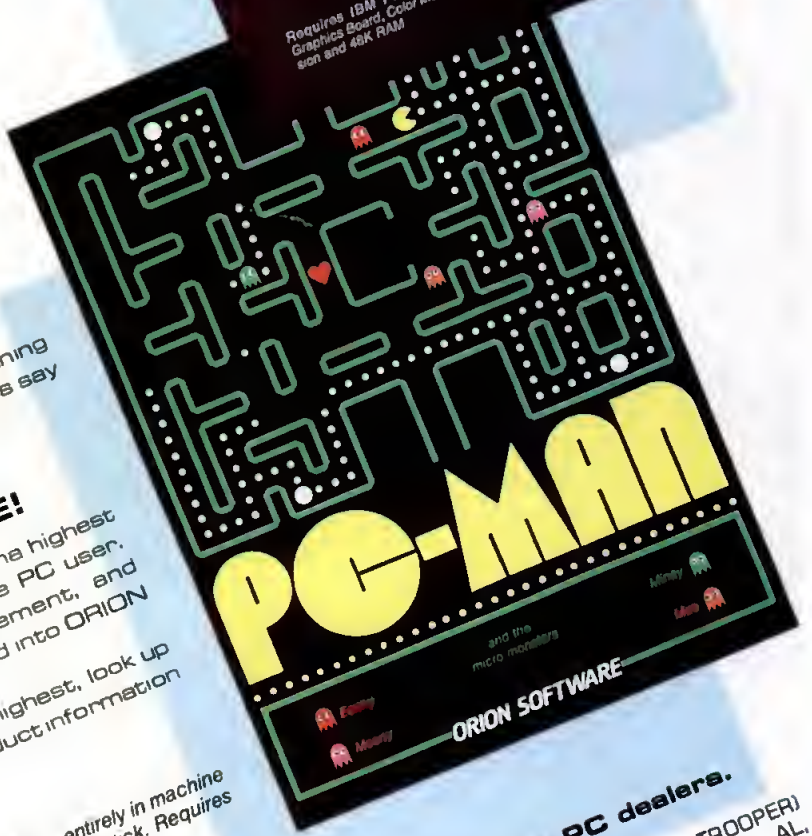

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Graphics that lose half their points, keys that repeat accidentally, and error messages that appear at startup are some of the problems solved in this session with the PC Tutor.

Revving Up RAM-disk

Coaxing Out Characters

Q: *I use WordStar on my PC with an NEC Spinwriter printer equipped with a multilingual thimble. I am unable to print the additional characters (beyond the standard 94 that are on the keyboard). Neither the IBM PC nor the WordStor manuals seems to offer any help. Can you give me a non-technical explanation of how to go about printing these characters?*

James L. Schaaf
Columbus, Ohio

A: *Having had some experience with the NEC Spinwriter manuol, I con understand your problem. The best answer I con give you will require some experimentation on your part. A method of changing the print attributes of WordStar was described in PC Magazine (Volume 1, Number 9, page 442). To access the special NEC characters, the oddresses in the instructions must be modified for the NEC.*

In particular, one suggestion might be to use USR1 and USR2 to switch between the two possible NEC fonts. If that is the case, then you would want to put the string 01 0F at USR1 to hove WordStar send the printer a signal to shift in, and 01 0E at USR2 to hove WordStar send a shift out signal.

As in the obove onswer, the sequence of commonds would be:

```
A>DEBUG B:WS.COM
-e77F 01 0F
-e784 01 0E
-w
Writing 5000 bytes
-q
A>
```

Moke sure you hove WordStar version 3.2. Other versions may hove USR1 and USR2 in different memory locations.

At this point, to print a foreign character, just surround the character with Ctrl-Q and Ctrl-W (use Ctrl-P to embed the control characters). Look at the Help message for Ctrl-P to get o feel for how this goes, and refer to the earlier article in PC.

The NEC printer uses standard ASCII input characters. Whenever a shift-in or shift-out is received, the NEC starts to print a different set of characters, so to print an O with an Umlaut, either Ctrl-Q O Ctrl-W or Ctrl-W O Ctrl-Q moy be required in the text. This will take some experimentation, so try surrounding all the characters in the alphobet with Ctrl-Q and Ctrl-W to see whot works and what doesn't.

Scientific Upgrade

Q: *My company is about to purchase its first IBM PC, for use principally in scientific applications. As such, I included in the order an 8087 chip with some associated software.*

I would like to know whether or not this upgrade package can actually deliver the performance of which the 8087 chip is intrinsically capable, as I know from direct contact with Intel.

John Weinberg
Northrop Electronics Division

A: *I have been osked this question by o number of people. One sent benchmorks comparing single-precision multiply and divide routines performed in compiled BASIC without the 8087 versus on ossembly longuage program using the 8087.*

The timing comparisons presented in my column for PC Volume 1, Number 8 were directly from the Intel monual. As such, they compare the best possible cases for each combinotion of Intel chips. Thus,

oll arithmetic wos doubie-precision (be worned thot IBM's FORTRAN is incopable of this precision), ond oll of the 8087 error checking wos emuloted in softwore.

The 8087 is o very powerful chip. It includes woys to detect roundoff errors, divide by zero, and overflow, oll following IEEE standards. Very often, floating point routines in commercial software will not take odvantage of oll of the nice obilities of the 8087. This means thot speed savings will be somewhot less than those indicated by Intel's timings. Furthermore, o fair amount of the time spent processing o program is for overhead; there are disk read routines, questions and answers, and probabiy o iot of ioops thot use integers.

Expect thot o completed program with o fair amount of floating point will hove o speed increase of no more than perhops 10–to–1 when using the 8087. The more double-precision number crunching there is in o program, the better the speed improvement. This is particulorly noticeoble with routines thot involve square roots and logorithms.

This rule of thumb is far more conservotive thon the speed increases disployed in the benchmarks thot Intei announced. Intel's softwore engineers ore so knowledgeabie obout their products thot they ore wizards ot using them to produce amazing benchmarks.

A COMPLETED program with a fair amount of floating point will have a speed increase of no more than perhaps 10–to–1 when using the 8087.

Colored Words

Q: Is there any way to get WordStar or VisiCalc to display in color? It would certainly be nice to get a green on black dispiey, instead of the usual white on bleck.

Thomas Koziol
Deer Park, New York

A: It is nearly impossible to coerce VisiCalc into doing anything. WordStar is onother motter.

If you do this carefully, the following opproach should work. This was done with WordStar version 3.20. Other versions of WordStar moy very weil locote the doto bytes ot other oddresses.

The following sequence of commonds will change low intensity to high and vice verso. The doto bytes only define the chorocter ottributes used by WordStar when disploying. (See page 2-50 of the IBM Technical Reference Monual for more documentation on ottribute bytes.)

Input the underlined choracters with the WordStar disk in drive B: and the DOS disk in drive A:.

```
A>DEBUG B:WS.COM
-e284
04EA:0284      07.0F
-e28B
04EA:028B      0F.07
-w
Writing 5000 bytes
-q
A>
```

Note thot due to differences in number of drives ond serioi odopters, your DEBUG moy not begin ot segment 04EA. Don't worry obout thot. if your version of WS.COM does not begin with o 07 ot locotion 284, then try to find the sequence 07 00 00 00 00 00 0F by using the "s" commond. Moke sure you do this with o copy of WS.COM, rother than the originol disk, since you moy make o fotal mistoke.

The 0F you enter into the first memory locotion means thot whot wos disployed as low intensity white (ottribute 07) becomes high intensity white (ottribute 0F). Similarly, whot was high intensity becomes low intensity, thanks to the second entry you execute.

To turn high intensity white into green, for exampie, enter o 0C (high intensity green) into the second memory locotion; you won't hove to perform the first entry.

Stuttering Keystrokes

Q: My WordStar has developed a problem that peeves me greatly. The space bar, even if depressed ever so briefly, now produces two spaces instead of one in about five percent of all cases. This occurs fully at random, without eny pattern.

Since WordStar performed reliebly for quite a while, I wonder what is the cause of this sudden deterioration? What can be done to remedy the situetion?

H. D. Laun
Mill Neck, New York

A: It sounds os if the culprit here is not WordStar, but the PC's keyboard. Try plugging in onother keyboard ond see if

PHYSICALLY, the keyboard is not well constructed.

thot heips. If not, perhops you are hoving stotic problems. A number of companies sell stotic mots (see "Out, Damned Spork!" in PC Voiume 1, Number 11 for some sources.)

Another possibility moy be thot the keyboard is foiling. Physically, the keyboard is not well constructed. Shocks can odverseiy offect its performance to the point where repiocement is necessary.

Quite o few readers hove complained obout probiems experienced when using the keyboard in conditions of very low humidity. As o lost resort, try installing o humidifier. The keyboard is o copocitative device, which means thot o key stroke is detected by circuitry thot notes substantial increoses in the gop between the keyboard base and o spring-controlled metol iever. The occurocy of this circuit can easily be odversely offected by excess static or changes in humidity.

Saving Graphics

Q: I have tried to use BSAVE and BLOAD for graphics work and heve found that the dispiay after BLOAD is not the same as the one seved with BSAVE. Instead it looks like half of the points on the screen are missing. Can you explain this?

Also, when I've turned on the computer, I have gotten a number of different error messeges such as 01 301, 03 301, and 07 301. Are these documented anywhere?

R. Joei Rahn
Ste.-Foy, Quebec, Canada

A: The first probiem you ore hoving hos to do with the woy graphics ore disployed by

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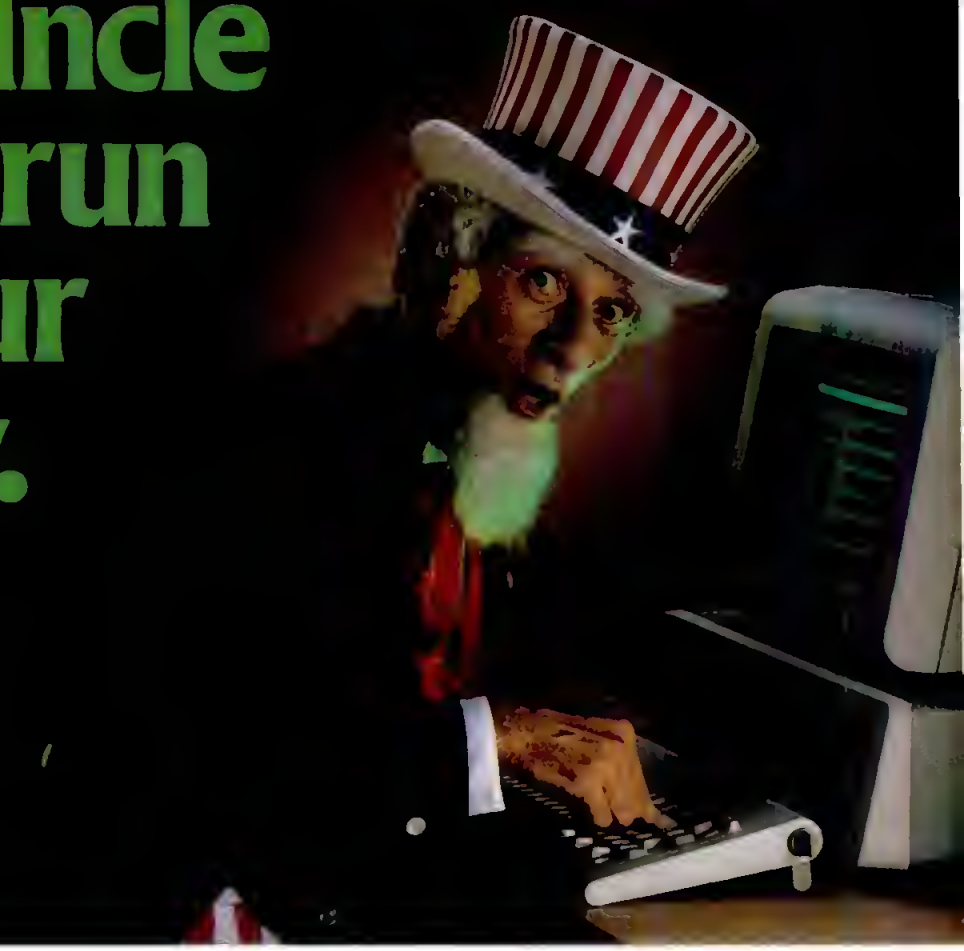

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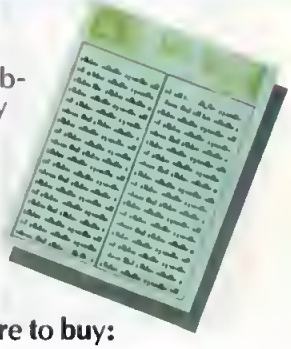

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the IBM color/graphics adapter. It uses different segments of memory for the even and the odd scan lines in a graphics display.

The top line of the display, line 0 (zero), begins at address B800:0000. (For an explanation of the hexadecimal format for address names, see my column in PC Volume 1, Number 9.) The next line on the display (line 1) begins at an address of B800:2000—that is 8192 higher in memory than line 0. Since line 0 requires 80 bytes for all of the dots (in high and medium resolution mode), the next even-numbered line, line 2, begins at address B800:0050. Line 3 begins at address B800:2050.

If you wish to save the whole screen, you can just BSAVE all 16K of display memory. If you want to save only the first ten scan lines, then you need to save five lines (or 400 bytes) beginning at B800:0000 (even lines 0 to 8), as well as five lines beginning at B800:2000 (odd lines 1 to 9). To redisplay the ten lines, just BLOAD both sets at their original addresses.

As for the error messages you have seen: some of them are partially documented in the problem determination section of the User's Guide. They are also documented in the source code in the Technical Reference Manual. For everyone's convenience they are provided here in Figure 1.

Power Punishment

Q: I use my PC on en occasional basis. When I do use it, I might went to use it over a long period of time but only for three or four trensactions.

Wbet is the effect on the PC when it is left on for several bours, es opposed to turning it off end on only when I need to use it? How can I figure out how much electricity is used wben the unit is on?

Dene Wylie
San Frencisco, California

A: That is an extremely difficult question to answer. Whenever they are turned on and off, electrical components tend to experience a physical shock from the expansion/controction cycle of heating and cooling. On the other hand, leaving the computer on will cause deteriorotion in the mechanical parts from wear, and in the electrical parts from sustained high temperatures.

My (not very scientific) guess would be that leaving the machine on for a few hours is better than turning it on and off repeatedly. If you leave the machine unattended for an hour or so, make sure you turn the brightness control on the monitor low enough that the screen appears blank. It is very easy to burn the phosphors on a monitor when charocters are displayed in the same place on the screen for an extended time period.

To determine how much power is consumed, the simplest approach would be to first turn off all of your electrical appliances, then check the reading on the electrical meter installed on your house by the utility company. Once you make sure nothing is moving on the meter, turn on the PC and use it for a few hours. Go back and recheck the electrical meter to see how much power was used up during that time period.

LEAVING the computer on will cause deterioration in the electrical parts from sustained high temperatures.

Avoiding Double Occupancy

Q: I hope you can help me with a very sticky end troublesome technical problem.

I have a PC with 128K end a monochrome display. Some time ago I wes toying with calling machine lenguage subroutines from BASIC. Since I have more than 64K, I chose to load the subroutines in the uppermost 64K of my machine (beginning at DEF SEG = &h1000).

After having all sorts of bizarre end erretic results with this epproach I began to suspect thet BASIC wes rendomly clobbering storage in the uppermost 64K of my machine. Is this so? I thought BASIC only used 64K.

Lerry Ellis
Wheeling, Illinois

A: In an earlier PC Tutor column (PC, Volume 1, Number 9) I discussed how the 8088 addresses via segments and offsets.

BASIC is restricted to a 64K code segment, but this segment does not need to start at location 0. In fact, BASIC begins at some arbitrory location determined by the size of DOS, how many drives you have,

Figure 1: Selected error messages with interpretations.

Hardware errors upon power-up	
Parity Check 1	- Serious memory error on system board
Parity Check 2	- Serious memory error on add-on RAM
1 long/1 short beep (followed by halted system)	- Miscellaneous hardware error
1 long/2 short beep	- Display memory or timing error
Diagnostics	
xx yy 201	Add-on RAM memory error xx = top byte of failed segment (e.g. xx = F5 => segment F500 failed) yy = 0 if parity error true bits => error in that bit (e.g. yy = 03 => bits 0 and 1 incorrect)
xx 301	Keyboard error xx = if blank, then invelid keyboard reset = scancode of stuck keys (see p. 2-17) (this mey heppen if you hold a key constently during reset)
131	Cassette interface error
601	Diskette controller error

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and whether any communicotions buffers ore selected.

BASIC will use up to 64K beyond thot point in memory. If you wish to use o mochine longuoge program thot is kept out of BASIC's reach, then I suggest you pick something beyond 96K since DOS and the buffers usuolly occupy well less thon 32K. If you are writing commercial programs, then even 96K isn't enough leeway; some users moy hove RAM-disk programs or print spoolers, all of which con toke up odditionol memory.

A for better opprooch would be to lood the subroutine into BASIC's doto orea by defining on orray lorge enough to hold the subroutine, ond then fill the orray using READ or BLOAD stotements.

Copying Tape Onto Disks

Q: I have two questions. First, I em considering buying a database of 7 MB which is availeble on e standard computer tape. The options are 7 or 9 track, end 800, 1600 or 6250 bits per inch.

Is it possible to convert this tape to load into my PC with PC DOS 1.1 end BASIC?

Second, I would like to purchase e commercial program that is advertised as requiring two drives. I currently have only one. For the sake of costs and speed, can I buy more memory to use this program with e RAM-disk instead of e second drive?

Robert Savryk
San Francisco, Californio

A: A number of manufocturers, including Innovotive Doto Technology of San Diego, Californio offer one-half-inch tope drives thot con be connected to o PC. Doto, typically 9-track 1600 BPI, is reod from tope, outomoticolly buffered, converted from EBCDIC to ASCII, ond transferred to the PC vio an osynchronous port. The some unit can also be used to write topes.

If you ore concerned only with looding one dotobase, the purchose of o tope drive moy be unnecessorily expensive. Several service bureous in Son Francisco offer the capobility of reading your tope. Once your tape hos been loaded, you should be oble to transfer the doto to your PC through o modem program with doto copture copobility. At 1200 boud, however, o 7MB file would require obout 16 hours, so you might not wont to use this method.

As to your second question: The obility to use o RAM-disk for o program thot requires two drives depends on the program. If the program is not copy-protected, then you con just run DISKCOPY, insert the second disk intended for drive B, ond copy it onto the RAM-disk instead. Remove the second disk from the drive ond insert the first disk. The program will then run fine. After the program finishes, you might wish to DISKCOPY the RAM-disk bock to the original second disk.

If the program is copy-protected, then most likely it will not work with o RAM-disk os the B drive.

COMPUTER service bureaus have the capability of loading and reading tape.

Exporting Bugs

Q: Importing documents between VisiCalc and EosyWriter II is en attractive feature which we have not been eble to eccess successfully. After many attempts, the EosyWriter II still is not receiving the imported VisiColc files. In some cases, partial files are imported but in e random fashion. Please help!

Meureen Seyles
Ithaca, New York

A: The version of EasyWriter you use hos o bug in its import/export feature. It will only work with single-sided disks. The eosiest solution is to just hove VisiCalc creote its DOS files on o disk formotted os single-sided. Use the FORMAT B:/1 syntox to formot the torget disk for VisiCalc.

This problem with VisiCalc is another exomple of why programs should not use operating systems of their own. /PC

The PC Tutor solves practical problems ond exploins points of general interest. If you'd like to see an answer to your questions, drop o line to PC Tutor, PC Mogozine, One Pork Avenue, New York, NY 10016.

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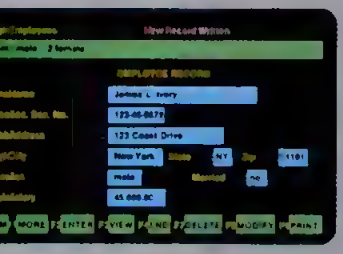

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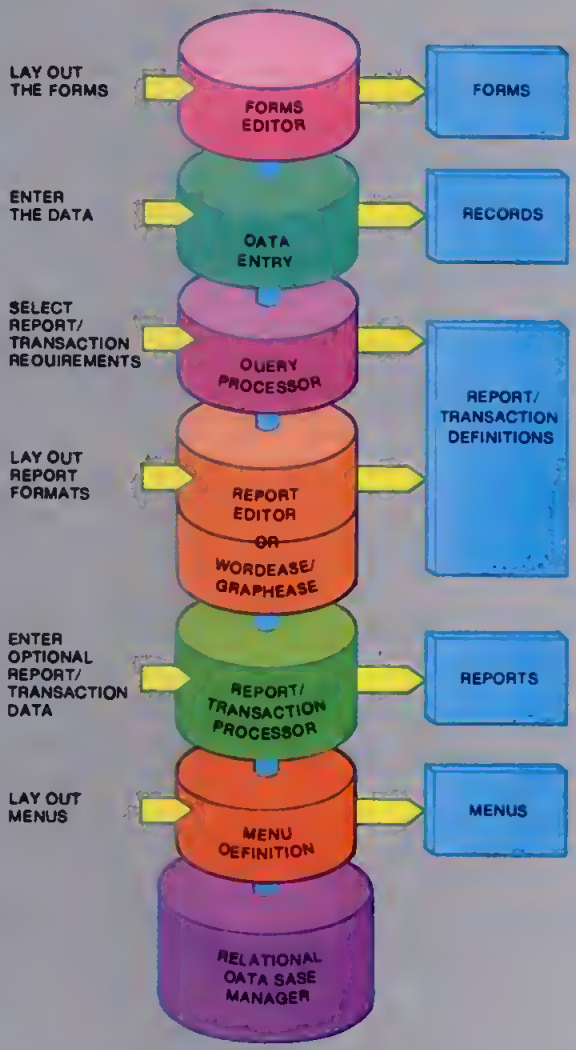

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COVER STORY/LINDSY VAN GELDER

A New England artist mixes his instinct for color and design with his interest in computing to create a lavish feast for the eyes.

COMPUTER ART FOR ART'S SAKE

If you think "computer art" consists mainly of dot metrix portraits on T-shirts and crazed splders from high-res outar spece, you're not entirely wrong. As artistic tools, computers ere still in their infancy—end most of the people who've gottan their hends on them probably drew more inspiration from REM statements than from Rembrandts.

"You know those spirographs that we all had when we were kids?" asks artist Mark Wilson. "Most of the computer art you see eround I'd liken to spirograph pictures beceuse, while the spirogreph producas patterns that are vary intaresting end curious, it's just not relevent to the conventions of the art world."

Wilson is moving to chenge all thet. For starters, he has the credantiels that count in the art world: an MFA from Yela, several one-men shows at New York galleries, and e grant from the National Endowment for the Arts. As you can judge for yoursalf from the accompanying reproductions of his work, ha has elavetad computer ert to a new, precipitously high plateau.

Wilson works in BASICA on a 64K, one-drive IBM PC hooked up to e medium-resolution Zenith composite color monitor and, via a sarial port, to a plotter. In the tredition of Vesarely, Mondrien and Klee, he creates vibrent, intricete geometric petterns on peper. Each ona is es weirdly beeutiful es e microscopic glimpse of a human hair or a drop of tap weter.

Step back from the intricacy and you'll see mecro designs thet quelify as computer art not only in their digital origins but also in their imagery. There ara many purely evocative forms es well: sheets of what look lika postaga stamps or country kitchen tiles; snippets of hieroglyphics; shepes reminiscent of such disparate objects es the beeded work of American Indians, the circular paste-on reinforcements for notebook paper, end dietoms. But if you look at Wilson's art and see primarily motherboerds and rows of RAM chips, you won't be the only one. "It does look like circuit boards," the artist cheerfully acknowledges, "or, es someone once said, 'like tha back of a TV set.' "

STEP BACK from the intricacy and you'll see macro designs that qualify as computer art not only in their digital origins but also in their imagery.

Not surprisingly, Wilson's "peintings" (which sall from $250 to $500) have been snepped up by the likes of Wang Laboretories, United Technologies, and tha architect Phllip Johnson.

Now 39, Wilson lives in rural Connecticut with his wife, Pamela, e high school sociel studies teachar, and their threa sons. (Like most parents with a PC in the house, he occasionally threetens to taka Microsoft's Decothlon "end throw tha disk in the fireplece.") A pharmacist's son, he grew up in Oregon end studied at Pomone College in California.

Influence of High-Tech Imagery

"I started out being obsassed with photography," he remembers. "When I began painting, my work was always very lineer, in the sanse of a lot of llnes, very datailed and vary intricate. Latar, I was influancad by microelectronics. The imegery of computar chips and circuits was extraordinary, just incredible! And beyond its richas and variety, it represented e new kind

of imegery." Such imagery, he edds, "isn't something I mimic or even necessarily make conscious reference to—but yes, it's there."

Around the same time, Wilson became aware of the work of an early eighteenth century French pelnter nemed P. Dominique Douat, wbo had created e set of petterned squares that could be combined into various decorative strings. It occurred to Wilson that it would have been terrific lf Douet hed had eccess to a computer. For that matter, it would be terrific if he hed eccess to e computer.

IF YOU look at Wilson's art and see primarily motherboards and rows of RAM chips, you won't be the only one.

But e decade ago, as Wilson recalls, "it just wasn't possible. I was alweys very covetously looking et these plotters thet cost about $100,000 end thet required a computer costing about three or four times that much."

Until the advent of the personal computer, Wilson relied on a mechanical drafting machine—e tool that he describes as "like e lerge straight-edge."

Painting By Numbers

Then, e little over 3 years ego, Wilson bought a Texes Instruments (TI) 99/4 home computer end e smell Houston Instruments plotter. "It took e while to get all the right interfeces," he seys. "Then I had to learn BASIC and learn to put graphlcs on the screen. And then there was the whole question of making images that I considered art." In fect, Wilson became so smitten by his new toy that, in addition to this art work, he opened a small software business (Linear Aesthetics Systems) that merkets e TI Rubik's Cube simuletion geme, programmed, not surprisingly, by Mark Wilson.

ATTRACTED by the IBM color/graphics board, Wilson upgraded last year to a PC and a larger plotter.

Attacted by the IBM color/grephics board, Wilson upgraded last year to a PC and a larger plotter, a Tektronix 4663. The 4663 costs ebout $12,000 new, but Wilson picked up a used one for half that with "a grant I'd just gotten from the National Endowment that was burning e hole in my

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pocket."

The "4663" in the plotter's name, in fact, is the source for the titles of his paintings: 4663 D12, 4663 E2, 4663 D10, 4663 C14. . . . "They're totally uninspired, unromantic titles," sighs Wilson. Although—who knows?—in an industry prone to such catchy monickers as "MX-80," "8088," and "RS232-C," his titles may have a certain haut-tech chic.

EVENTUALLY I'd like a compiler, but my plotter moves about 22 inches a second, and BASIC is always way ahead of it.

Wilson mixes his own paint colors, using what artists call "wet-ink pens" rather than the standard plotter colors. He also has written all his own graphics software. "My programs are relatively simple and inelegant," he insists. Everything is done in Advanced BASiC, without a compiler, and while Wilson is intrigued by the possibility of eventually programming in LOGO, he finds (BASiC haters, take note) that the BASiCA graphics are sufficient for his needs. "Eventually, I'd like a compiler," he says, "but my plotter moves about 22 inches a second, and BASiC is always way ahead of it."

When Wilson began programming, he "thought it would be nifty to put a whole picture on the screen and then dump out." He's since decided, however, that "it's more fun to play it by ear, as the spirit moves me." He describes his creative method as "working interactively" with the hardware and the software. "i put various kinds of random lines, circles, rectangles, and little U-shapes and L-shapes on the screen," he explains. The software allows me to use the BASiC Point command to dump any of those shapes onto the plotter." Because the size of his paper (20 inches by 38 inches) is larger than the 17 inch by 22 inch work aree permitted by the Tektronix, he has to scroll the canvas manually and inscribe it in sections.

Such techniques give the artist a certain sense of serendipity. "Most artists go about their work in an intuitive way:

HE DESCRIBES his creative method as "working interactively" with the hardware and the software.

They'll say, 'I want to put a red triangle in that corner,' whereas i'll have to say I want . . . say, an x coordinate of 2337 and a y coordinate of 2767. In a way, that's

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counter-intuitive, but from my standpoint, it produces variety.

"Unexpected things sometimes happen. Sometlmes they're awful, of course, but sometimes they're good. Artists heve e tendency to get stuck in ruts, and the computer hes been known to jolt me out of mine." He hestens to edd that "the idea isn't to get the computer to do the paintlng. I think of it the wey e writer does e word processor—as a kind of clever, eutomatic helper."

Everything in Wilson's current work could be done by hand without a computer, "but I probebly never would have done it. Thet's whet's neat about these machines: They allow you to do things you wouldn't otherwise have the time or the gumption to try." (Even with the help of the computer, it takes Wilson several days to produce a graphic.)

Future Trends

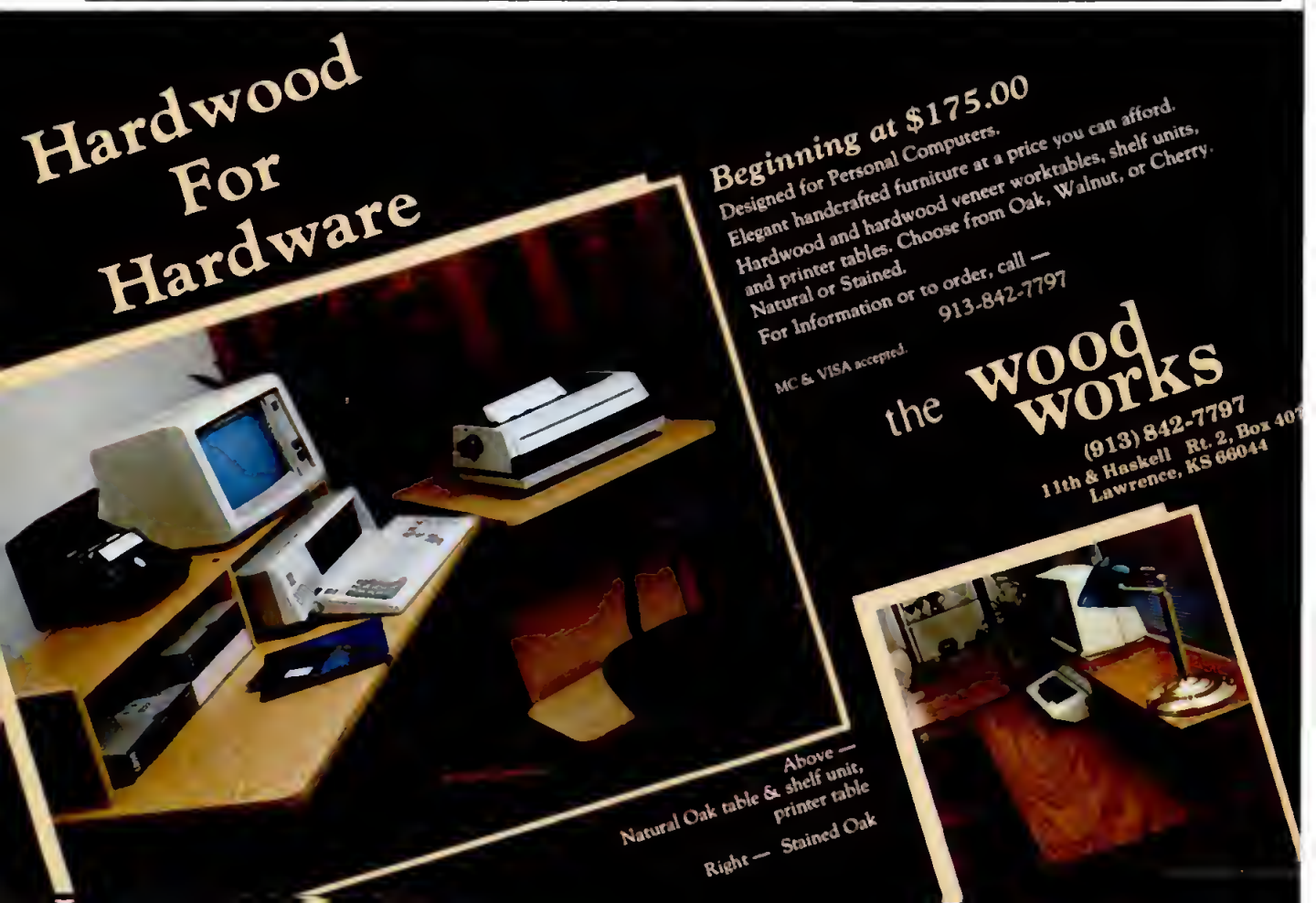
As for the future of computer ert, Wilson points out that "you can go back to the High Renaissance in the West and find a lot of artists who were involved in mathemetical enalysis—that's whet Albrecht Durer's woodcuts were, essentially." The contemporary split between whet constitutes science end what qualifies as Art-with-a-capital-A is culturel, not neturel. At the Boston SIGGRAPH computer grephics show lest yeer Wilson wes "blown ewey" by trends in the field. He cites the work Dr. Benoit Mandelbrot, an IBM Fellow who recently created a new branch of math, fractal geometry, thet can be used to program irregular shapes into rather startlIng meinframe-computer graphics. According to Wilson, "Mandelbrot's frectal logarithms were used in the movie *The Wrath of Khan* to simulate the transformetion of a perticuler planet's stony mountain landscape into lush green. I thought it was spectacular."

THE contemporary split between what constitutes science and what qualifies as Art-with-a-capital-A is cultural, not natural.

"Probably 99 percent of what these machines are used for is ebsolutely mundane end routine: accounts payable end so on," he adds. "But just the fact that they can be used by en ertist or a musician or to do any of a hundred zany, crazy, offbeat things is e test of the power of these devices. It proves to me thet they're reelly universel tools." */PC*

For more information on Mork Wilson's pointings, contoct the ortist ot P.O. Box 23, West Cornwoll, CT 06796.

Lindsy Van Gelder is o contributing editor for PC Magazine.



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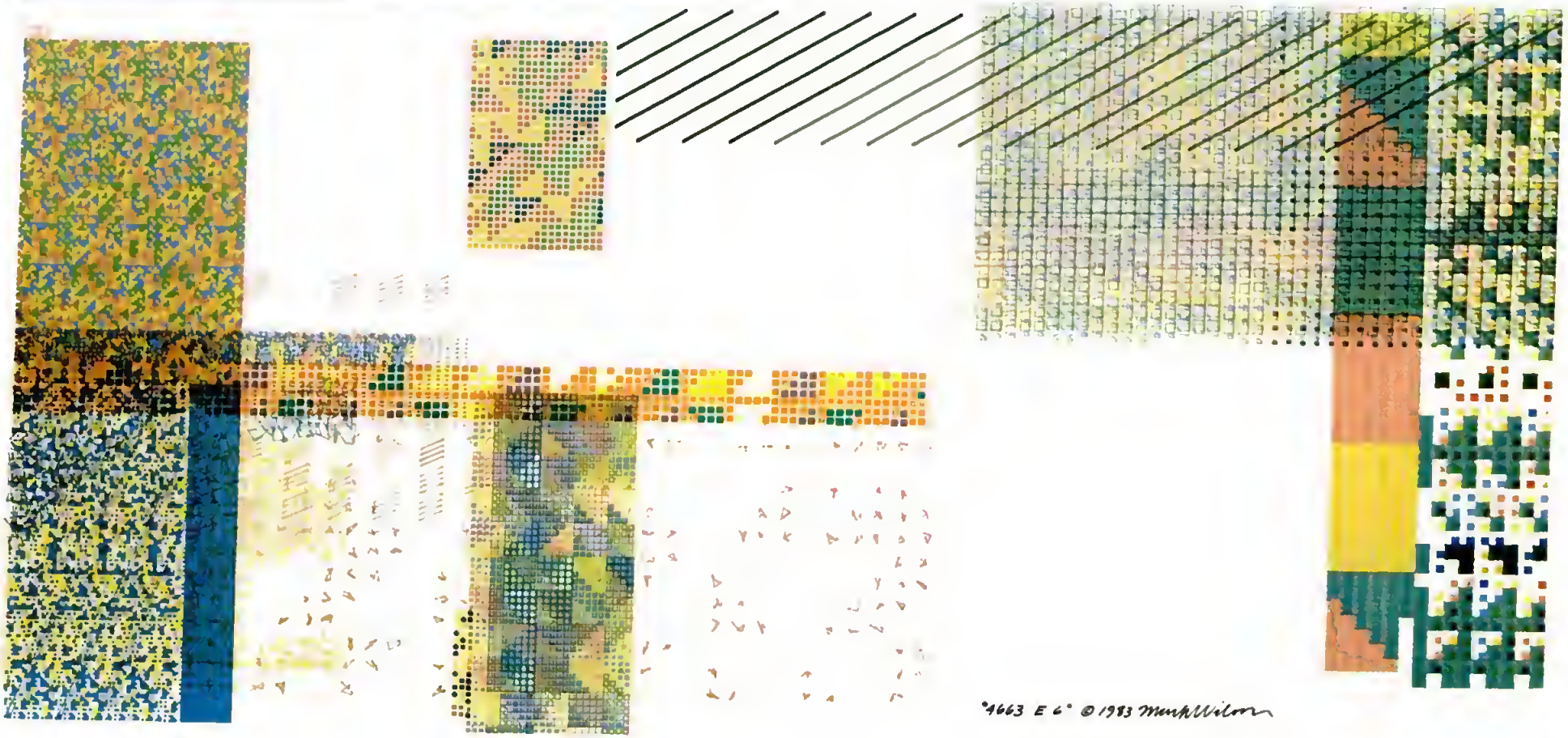

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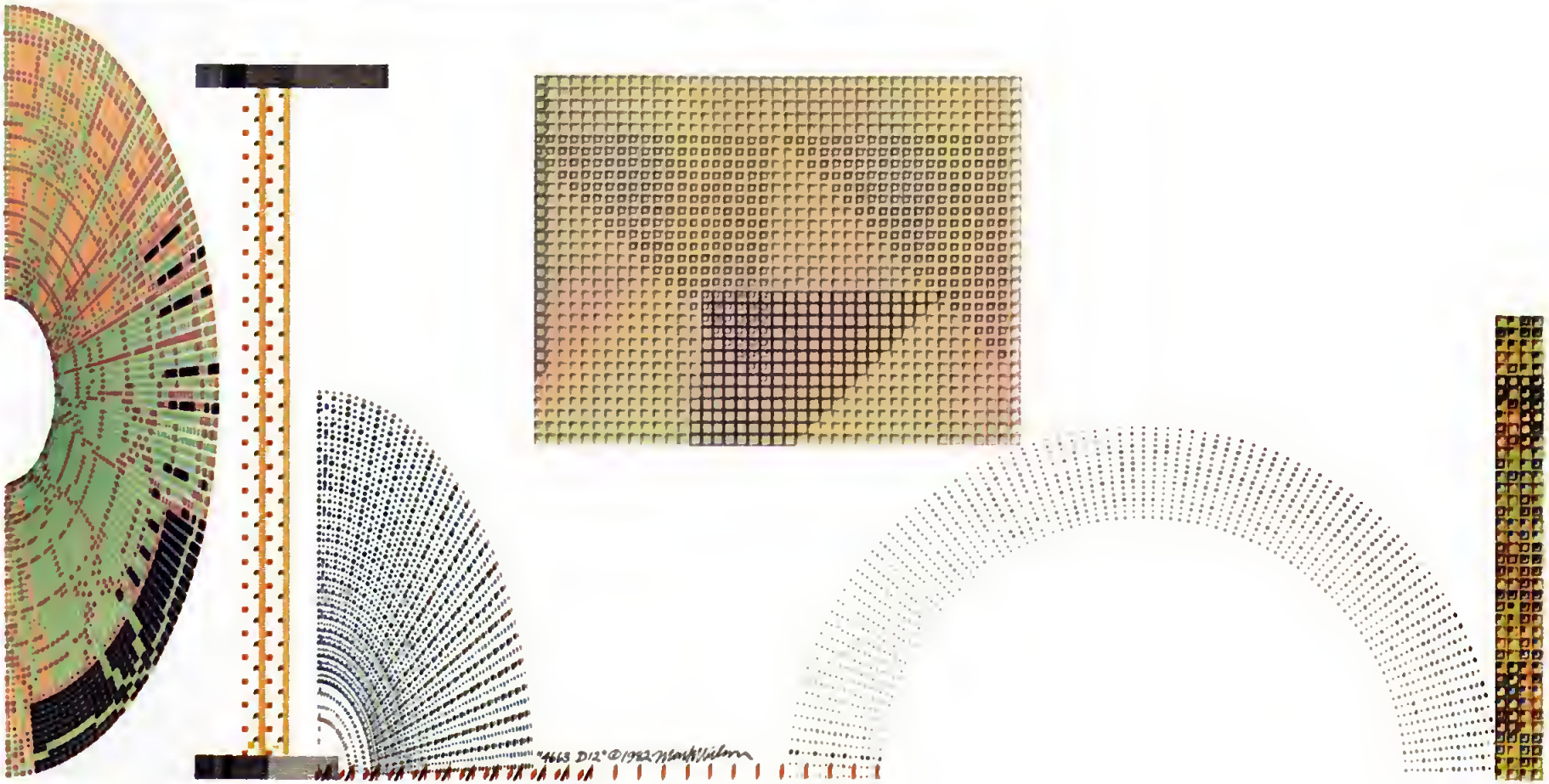

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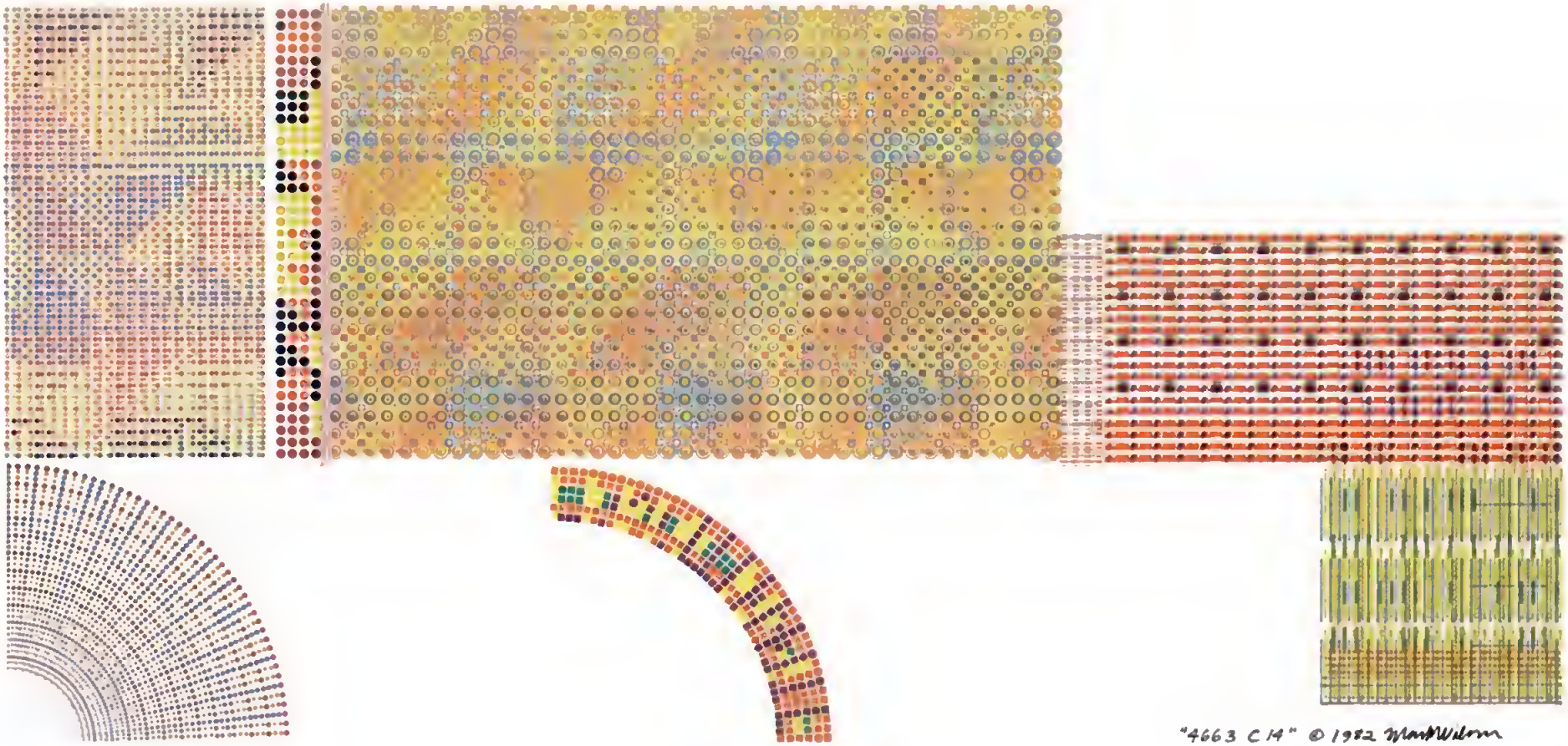
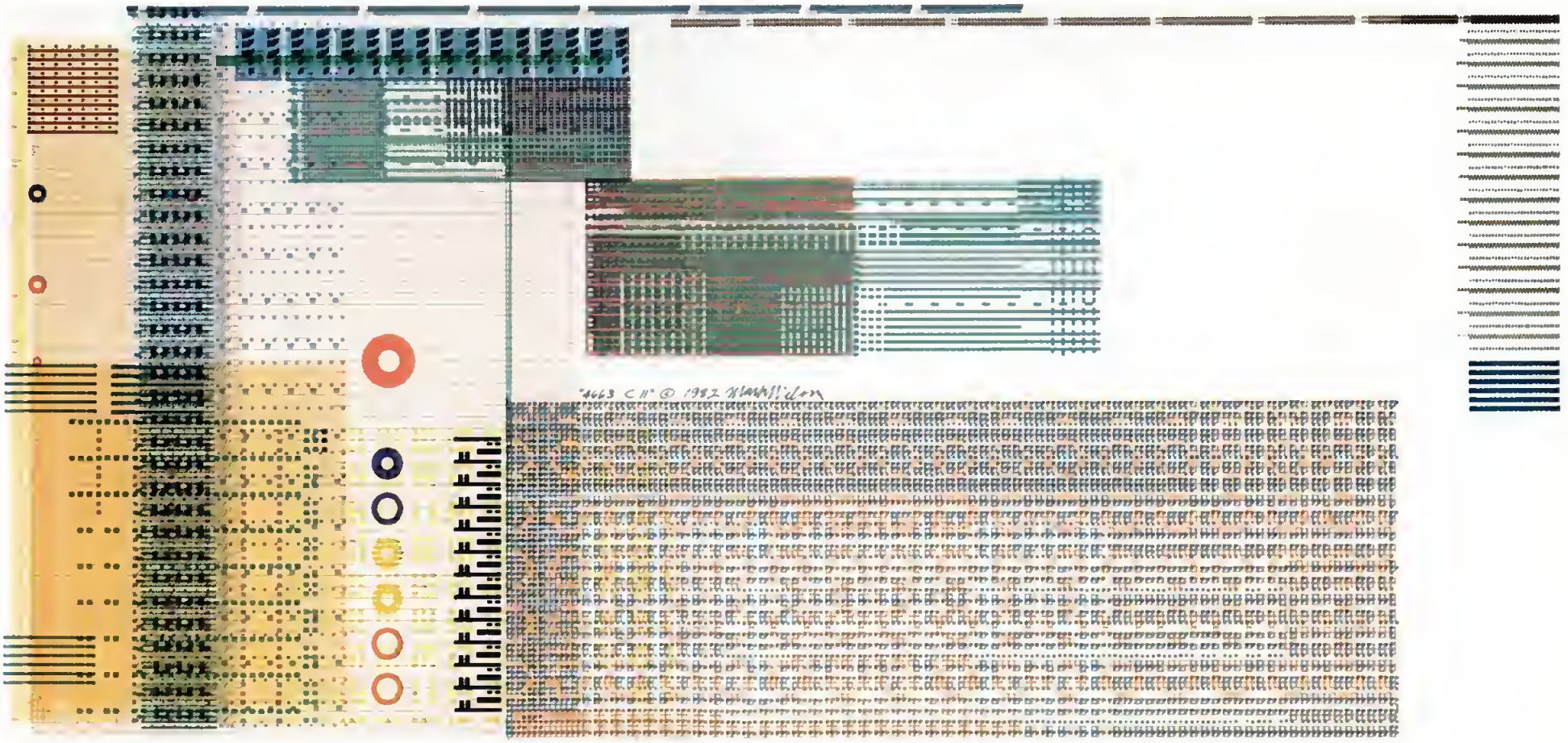


"4663 C14" © 1982 Mark Wilson

"4663 C11"



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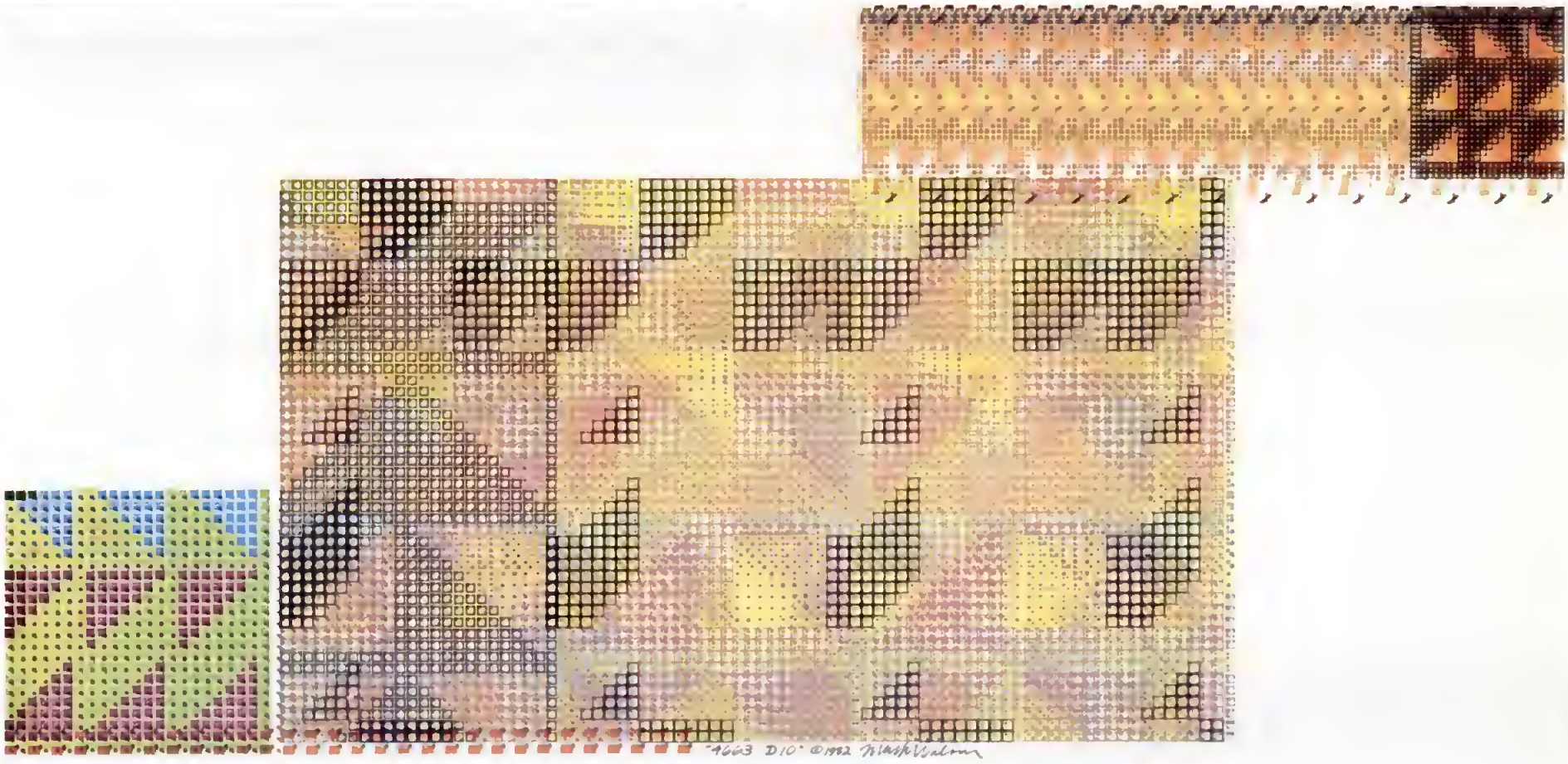

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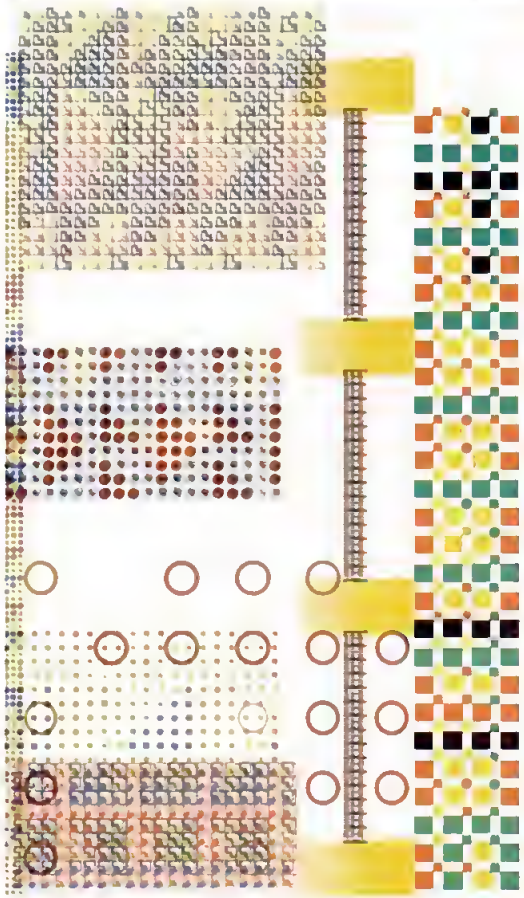

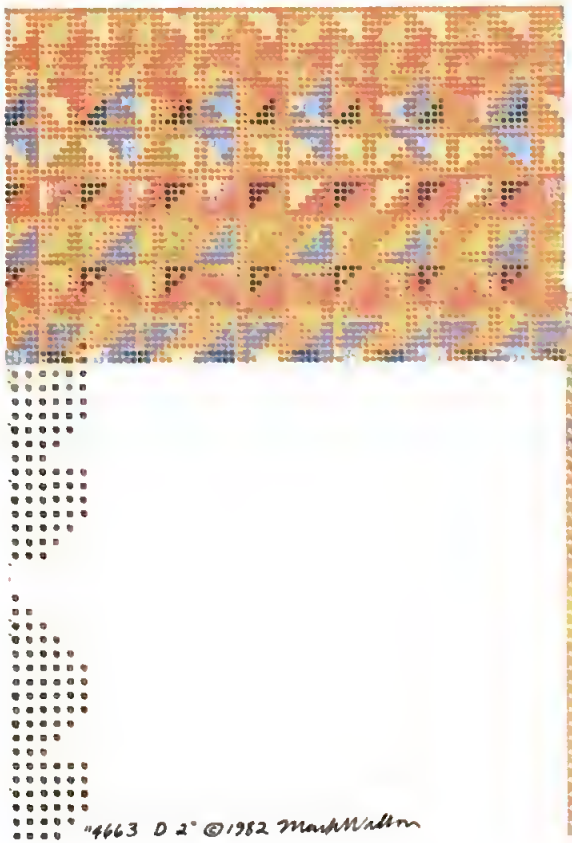

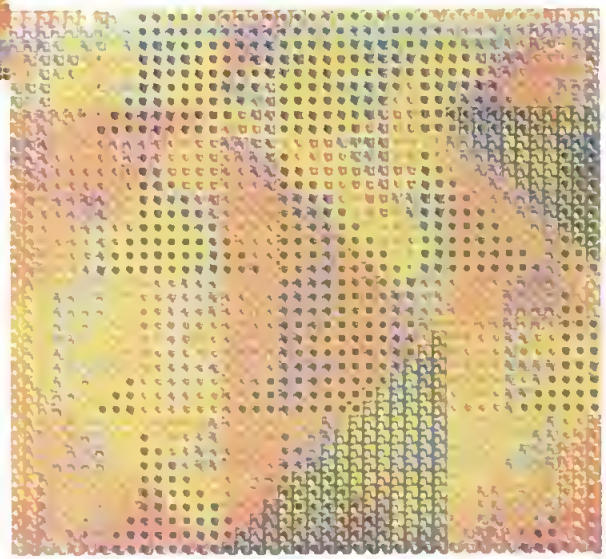

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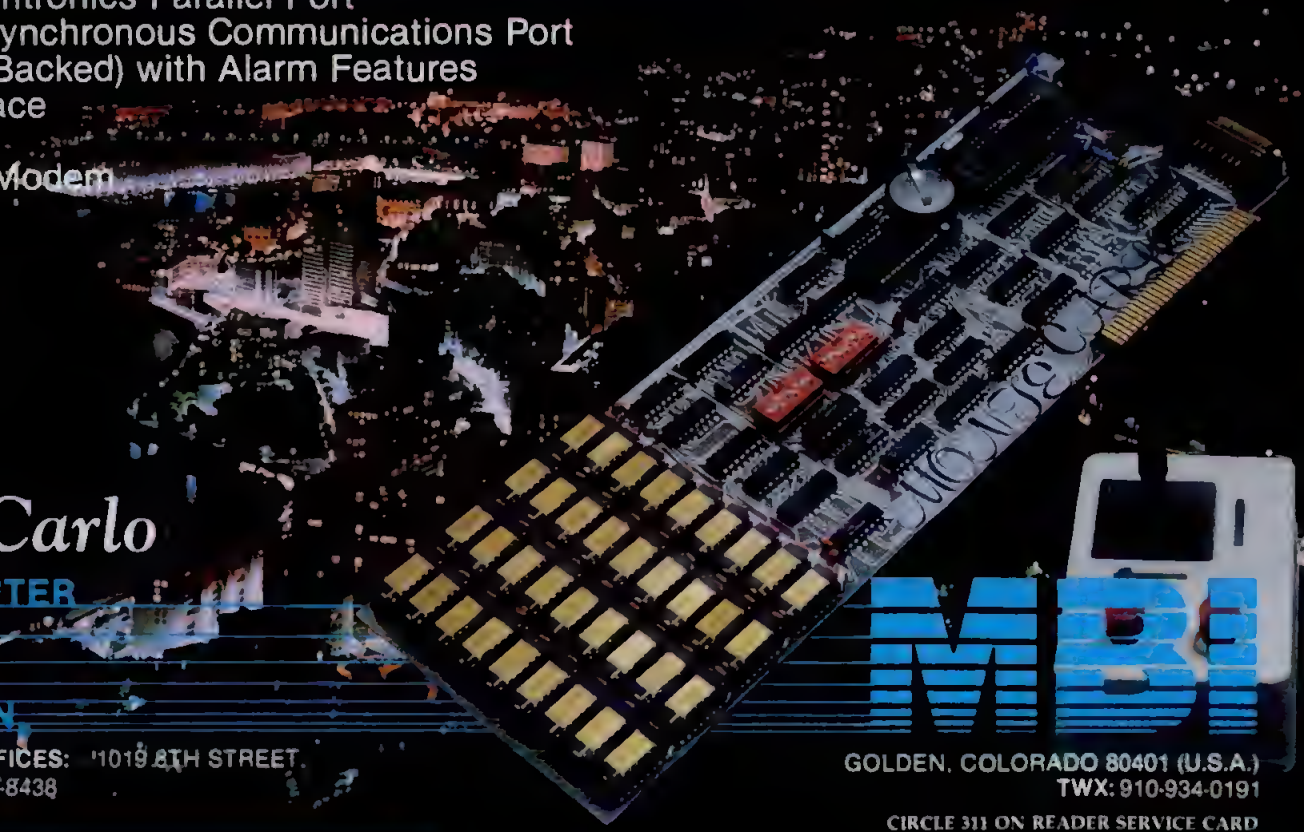

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Who Was P. Dominique Douat?

What goes around comes around.

P. Dominiqua Douat was a religieux Corme, a member of the Roman Catholic mendicant Order of Our Lady of Mount Carmal. We know thet his lifetime bridged the lata seventeenth and early eighteenth centurias. And wa know his work. Wa know too that his place in history has been secured by tha inclusion of his parmutation tables in a publication of tha Royal Academy of Sciences of Peris ebout 250 yaars ago.

We can only imegine tha steady progression of his days—up before dawn to join his brothers in prayar and in tha quotidian pursuit of monastic duty. Perhaps a sparse breakfast in a dacoratively-bare but architecturally-rich room filled with stout tables.

Maybe each dey after lunch and before vespers, Douet resarved a couple hours to pursue his private passion, tha permutetions that centuries latar would so intrlgue Mark Wilson.

Another question. Ware thase "graphic verietions on a theme" the result of an intarest unique to himself? It seems not. In the sixtaanth century, Barnard de Lavinheta publishad all permutations of tha sequence BCDT. (in one of his books ha discusses "artificial mamory," distinguishing it sharply from "sansibilie" and "intalligibilia.") Thare are references to experimentation in this field es early as the fourteenth century.

Douat, then, was both the inheritor and tha anlarger of a tradition. He was e men of his time—end, it turns out, e man of ours.

Douat started aech parmutation with a singla two-colored square divided diagonally es shown in Figure 1. By rotating the square ha achiaved four variants. Combinlng thesa variants at different angles of rotation produces 16 possibilities.

Figure 2 shows his explanation of thasa permutations using lattar symbols (A,B,C,D) to refar to the engles of rotation.

Sets of 3 produce 64 permutations, sets of 4, 256. Figures 3 and 4 show tha last of thasa (from 193 to 256) in both letter end graphic reprasantations.

Thare are 72 furthar varietions shown in the plates of Douat's work. The first six of these is shown in Figure 5. Tha last in figure 6.

Douat's plates show tha geomatrical variants possible with only one simple form and only two colors. Vary the form—how about e triangle in a square? Or tha color—blua, brown, purpla? Try a littla asymmetry; the exponential growth of variations stretches to infinity. It boggles tha mind—but not tha computer!

WE CAN ONLY imagine the steady progression of his days.

Mark Wilson says, "Douet's systam, producad so laboriously with a pen almost 300 years ago, can be executed by a computer in a flash. And today, many computar graphics systams—LOGO, for example—have devised progressions of permutations identical to Douat's."

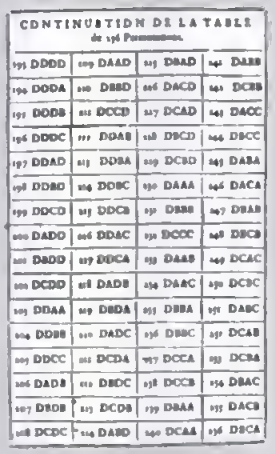
—Kotherine Harrick

For more informotion, refer to The Sense of Order by E. H. Gombrich (pp. 70-72, Pheidon Press Limited, 1979). Also see the epilogue to Ramon Lull and Lullism in Fourteenth Cantury Franca by J. N. Hillgorth (Oxford Press, 1971). Prints of o sixteenth-century Lullian, Bernord de hovinheto, con be found in his Opara Omnia (pp. 142-53, Bibliopolis, 1612).

Figure 1

Figure 2

Figure 3



193 DDDD	209 DAAD	225 DBAD	241 DABB
194 DDDA	210 DABD	226 DACD	242 DCBB
195 DDDB	211 DCCD	227 DCAD	243 DACC
196 DDDC	212 DBAB	228 DBCD	244 DBCC
197 DDAD	213 DDBA	229 DCBD	245 DABA
198 DDBD	214 DDBC	230 DAAA	246 DACA
199 DDCD	215 DDCB	231 DBBB	247 DBAB
200 DADD	216 DDAC	232 DCCC	248 DBCB
201 DBDD	217 DBCA	233 DAAB	249 DCAC
202 DCDD	218 DADB	234 DAAC	250 DCBC
203 DDAA	219 DBDA	235 DBBA	251 DABC
204 DDBB	220 DADC	236 DBBC	252 DCAB
205 DDCC	221 DCDA	237 DCCA	253 DCBA
206 DADB	222 DBDC	238 DCCB	254 DBAC
207 DBDB	223 DCDB	239 DBAA	255 DACB
208 DCDC	224 DABD	240 DCAA	256 DBCA

Figure 4

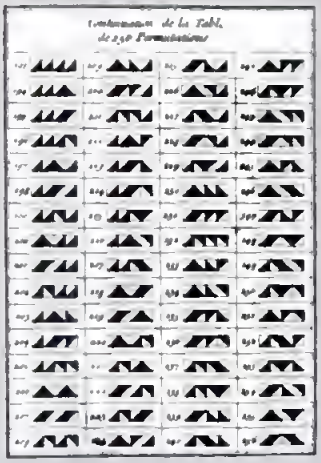


Figure 5

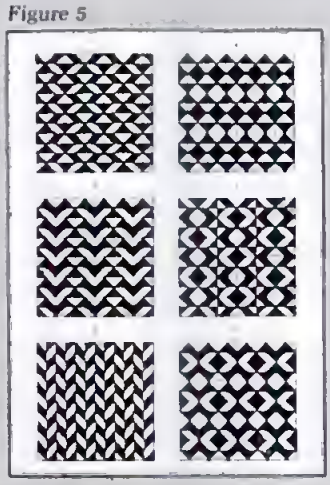
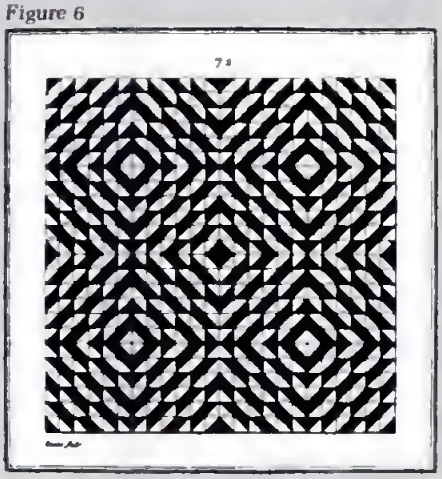


Figure 6



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CIRCLE 361 ON READER SERVICE CARD

The Permutations of Frère Douat

This program demonstrates the centuries-old geometrical theories rediscovered by Mark Wilson.

The program below fills the screen with intricate petterns of colored triangles, based on a series of permutations devised at the heginning of the eighteenth century hy P. Dominique Douet. Triangles are among the best graphics huilding hlocks, as they can form squares, rectangles, ohlique parallelograms, stars, and other interesting shapes. Douet divided a square in half to form two right-angle triangles, and colored in one of the halves. He realized that by rotating this square he could produce four distinct patterns. Two such squares yielded 16 possible permutations, three squares 64, and four squares 256.

PC-Douot ellows combinations of up to 9-square patterns. This is determined by the user-estahlished level of symmetry. A setting of 0 produces a screenful of identical columns (with no variation); a setting of 1 adds one level of difference; 2 adds two, etc.

Users can elso set the scale (size) and spacing. The smallest scale setting will produce tiny triangles 3 pixels high; the largest, ungainly triangles that measure 40-pixels. To obtain Douat's original spacing, set the spacing fector 1 higher than the scale. A typical setting would be a scale of 5 and e spacing of 6. Smaller figures take longer to fill the screen but seem to produce the most interesting effects; larger ones take up so much room they don't really show the program to its best advantage.

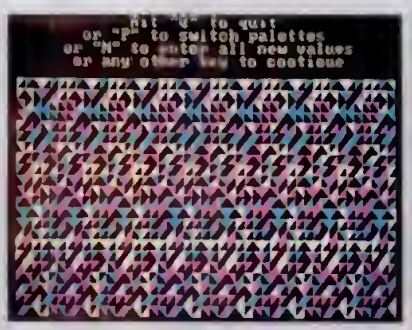
Startling effects can be produced hy backing up triangles over each other, that is, hy entering smaller spacing factors than scaling fectors. The program will warn you that the spacing is tight if you try to do this, but will let you continue. Other interesting patterns can result from small scaling factors and large spacing settings that will spread out tiny triengles ecross your screen.

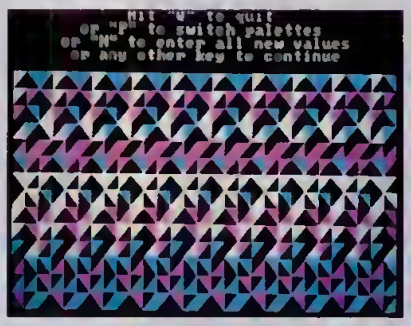
PC-Douot allows you to switch back and forth between palettes, and escape to the main menu from eny point in the program. Once you produce an initial screen, the menu will remind you which settings you entered for the previous pattern. The permutations are hased partially on random numbers pulled out of an array. it will take a little more than a minute to fill this array the first time you use the program.

STARTLING effects can be produced by backing up triangles over each other.

You can adept PC-Douot to dump the screen to e color printer, or even an IBM graphics printer that can produce different grey levels. You can elso experiment with it hy changing the PSET action in the PUT statements to PRESET, which will produce a pattern of negative images, or hy drawing and painting such figures as circles rather than triangles. PC-Douot requires the IBM color graphics board, but will work on both color and monochrome screens.

—Poul Somerson





```
100 ' "PC-DOUAT" — For readers of PC Magazine / Volume 1, Number 12
110 ' (c) 1983 Mark Wilson; adapted for PC Magazine by Paul Somerson
120 '
130 '     This program produces very intricate geometric designs
140 '     using an 18th century algorithm.  When you start using
150 '     this try entering S-M-A-L-L scaling and spacing values.
160 '     Later, experiment with various numerical combinations—
170 '     including smaller SPACING factors than SCALING factors.
180 '     The lower the symmetry factor the more orderly the art.
190 '
200 '          *** initial setup; color or mono monitor ***
210 '
220 FOR FK=1 TO 10:KEY FK,"":NEXT
230 TEST=0:DEFINT A-Z:KEY OFF:SCREEN 0,1:COLOR 7,0,0:WIDTH 80
240 COL1=7:COL2=7:COL3=7:COL4=7:COL5=7:COL6=7:COL7=7:COLA=23
250 DIM D1(400),D2(400),D3(400),D4(400),D5(400),D6(400)
260 DIM D7(400),D8(400),D9(400),D10(400),D11(400),D12(400)
270 RANDOMIZE(VAL(RIGHT$(TIME$,2))):Q$=CHR$(34):CLS
280 LOCATE 10,23,0:PRINT "Do you have a color monitor? (Y/N)"
290 IN$=INKEY$:IF IN$="" THEN 290
300 IF IN$="Y" OR IN$="y" THEN 310 ELSE 350
310 COL1=1:COL2=2:COL3=3:COL4=4:COL5=5:COL6=6:COL7=7:COLA=20
320 '
330 '                    *** box elements ***
340 '
350 COLOR COL1:CLS
360 TL$=CHR$(201)+STRING$(23,205):TR$=STRING$(23,205)+CHR$(187)
370 BL$=CHR$(200)+STRING$(23,205):BR$=STRING$(23,205)+CHR$(188)
380 LOCATE 6,17:PRINT TL$+TR$:V$=CHR$(186)
390 FOR W=7 TO 14:LOCATE W,17:PRINT V$:LOCATE W,64:PRINT V$:NEXT
400 LOCATE 15,17:PRINT BL$+BR$
410 '
420 '                         *** title ***
430 '
440 COLOR COL4:LOCATE 8,36:PRINT Q$;"PC-DOUAT";Q$:COLOR COL2
450 LOCATE 10,19:PRINT "This produces patterns based on permutations"
460 LOCATE 11,22:PRINT "suggested by P. Dominique Douat in 1704"
470 COLOR COL6:LOCATE 13,28:PRINT "(Hit any key to continue)"
480 J$=INKEY$:IF J$="" THEN 480
490 '
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```
500 '         *** twin boxes and storage of old values ***
510 '
520 COLOR COL1:CLS:LOCATE 3,18:PRINT TL$+TR$
530 FOR W=4 TO 12:LOCATE W,18:PRINT V$:LOCATE W,65:PRINT V$:NEXT
540 LOCATE 13,18:PRINT BL$+BR$:COLOR COL5
550 COLOR COL5:LOCATE 14,18:PRINT TL$+TR$
560 FOR W=15 TO 19:LOCATE W,18:PRINT V$:LOCATE W,65:PRINT V$:NEXT
570 LOCATE 20,18:PRINT BL$+BR$
580 COLOR COL4:LOCATE 16,27:PRINT "(Hit <ENTER> key if necessary)"
590 IF OLDSPACE=0 THEN 640 ELSE COLOR COL2
600 LOCATE 17,43:PRINT "Old spacing #:";OLDSPACE
610 LOCATE 17,24:PRINT "Old scale #:";OLDSCALE
620 LOCATE 18,43:PRINT "Old symmetry #:";OLDSYM
630 LOCATE 18,24:PRINT "Old random #:";OLDRAND;SPC(3):GOTO 680
640 COLOR COL2:LOCATE 18,31:PRINT "Hit <ESC> to start over"
650 '
660 '                    *** random factor ***
670 '
680 COLOR COL6:LOCATE 5,23,0:PRINT "Enter a random factor from 0 to 9:"
690 J$=INKEY$:IF J$="" THEN 690
700 IF J$=CHR$(27) THEN 520
710 RFAC=VAL(J$):IF RFAC<0 OR RFAC>9 THEN 690
720 LOCATE 5,57:COLOR COL3:PRINT RFAC:COLOR COL6
730 '
740 '                     *** scale factor ***
750 '
760 LOCATE 7,23:PRINT "Enter a scale factor from 3 to 40:";SPC(3):SF$=""
770 J$=INKEY$:IF J$="" THEN 770
780 IF J$=CHR$(27) THEN 520
790 IF SF$="" AND J$="0" THEN BEEP:GOTO 770
800 IF J$=CHR$(13) AND LEN(SF$)=1 THEN SF$=" "+SF$:GOTO 830
810 IF ASC(J$)>47 AND ASC(J$)<58 THEN 820 ELSE BEEP:GOTO 770
820 SF$=SF$+J$:LOCATE 7,58:COLOR COL3:PRINT SF$
830 IF LEN(SF$)=2 THEN DX=VAL(SF$):GOTO 840 ELSE 770
840 IF DX>40 OR DX<3 THEN BEEP:COLOR COL6:GOTO 760
850 '
860 '                    *** symmetry factor ***
870 '
880 COLOR COL6:LOCATE 9,23:PRINT "Enter a symmetry factor from 0 to 9:"
890 J$=INKEY$:IF J$="" THEN 890
900 MF=VAL(J$):IF J$=CHR$(27) THEN 520
910 IF MF<0 OR MF>9 THEN 890 ELSE COLOR COL3:LOCATE 9,59:PRINT MF:COLOR COL6
920 '
930 '                     *** spacing factor ***
940 '
950 LOCATE 11,23:PRINT "Enter a spacing factor from 2 to 99:";SPC(3):SPF$=""
960 J$=INKEY$:IF J$="" THEN 960
970 IF J$=CHR$(27) THEN 520
980 IF SPF$="" AND J$="0" THEN BEEP:GOTO 960
990 IF J$=CHR$(13) AND LEN(SPF$)=1 THEN SPF$=" "+SPF$:GOTO 1020
1000 IF ASC(J$)>47 AND ASC(J$)<58 THEN 1010 ELSE BEEP:GOTO 960
1010 SPF$=SPF$+J$:LOCATE 11,60:COLOR COL3:PRINT SPF$
1020 IF LEN(SPF$)=2 THEN DSP=VAL(SPF$):GOTO 1030 ELSE 960
1030 IF DSP>99 OR DSP<2 THEN BEEP:COLOR COL6:GOTO 950
1040 '
1050 '          *** warning if spacing = or < object size ***
1060 '
1070 IF DSP<=DX THEN 1080 ELSE 1170
1080 FOR W=16 TO 18:LOCATE W,19:PRINT SPC(41):NEXT
1090 COLOR COLA:LOCATE 16,27:PRINT "WARNING--your spacing is tight"
1100 COLOR COL3:LOCATE 17,29:PRINT "Hit ";Q$;"C";Q$;" to continue anyway"
1110 COLOR COL2:LOCATE 18,25:PRINT "Or hit any other key to start over"
1120 JK$=INKEY$:IF JK$="" THEN 1120
1130 IF JK$="C" OR JK$="c" THEN 1170 ELSE 520
1140 '
1150 '                    *** palette selection ***
1160 '
1170 FOR W=16 TO 18:LOCATE W,19:PRINT SPC(41):NEXT
1180 COLOR COL4:LOCATE 16,27:PRINT " ------SELECT A PALETTE------ "
1190 COLOR COL3:LOCATE 17,28:PRINT "Hit ";Q$;"1";Q$;" for blue/cyan/magenta"
1200 COLOR COL6:LOCATE 18,28:PRINT "Hit ";Q$;"2";Q$;" for green/red/yellow"
1210 PAL=VAL(INKEY$):IF PAL<1 OR PAL>2 THEN 1210
1220 SCREEN 1,0:COLOR 0,PAL:CLS:I=1
1230 OLDRAND=RFAC:OLDSCALE=DX:OLDSYM=MF:OLDSPACE=DSP
1240 '
1250 '                    *** Douat permutations ***
```

```
1260 '
1270 LINE(0,0)-(DX,0),1:LINE-(0,DX),1:LINE-(0,0),1
1280     PAINT(1,1),1:GET(0,0)-(DX,DX),D1:CLS
1290 LINE(0,0)-(0,DX),1:LINE-(DX,0),1:LINE-(0,0),1
1300     PAINT(1,2),1:GET(0,0)-(DX,DX),D2:CLS
1310 LINE(0,DX)-(DX,DX),1:LINE-(DX,0),1:LINE-(0,DX),1
1320     PAINT(DX-1,DX-1),1:GET(0,0)-(DX,DX),D3:CLS
1330 LINE(0,0)-(DX,DX),1:LINE-(DX,0),1:LINE-(0,0),1
1340     PAINT(2,1),1:GET(0,0)-(DX,DX),D4:CLS:1=1+1
1350 LINE(0,0)-(DX,0),1:LINE-(0,DX),1:LINE-(0,0),1
1360     PAINT(1,1),1:GET(0,0)-(DX,DX),D5:CLS
1370 LINE(0,0)-(0,DX),1:LINE-(DX,0),1:LINE-(0,0),1
1380     PAINT(1,2),1:GET(0,0)-(DX,DX),D6:CLS
1390 LINE(0,DX)-(DX,DX),1:LINE-(DX,0),1:LINE-(0,DX),1
1400     PAINT(DX-1,DX-1),1:GET(0,0)-(DX,DX),D7:CLS
1410 LINE(0,0)-(DX,DX),1:LINE-(DX,0),1:LINE-(0,0),1
1420     PAINT(2,1),1:GET(0,0)-(DX,DX),D8:CLS:1=1+1
1430 LINE(0,0)-(DX,0),1:LINE-(0,DX),1:LINE-(0,0),1
1440     PAINT(1,1),1:GET(0,0)-(DX,DX),D9:CLS
1450 LINE(0,0)-(0,DX),1:LINE-(DX,0),1:LINE-(0,0),1
1460     PAINT(1,2),1:GET(0,0)-(DX,DX),D10:CLS
1470 LINE(0,DX)-(DX,DX),1:LINE-(DX,0),1:LINE-(0,DX),1
1480     PAINT(DX-1,DX-1),1:GET(0,0)-(DX,DX),D11:CLS
1490 LINE(0,0)-(DX,DX),1:LINE-(DX,0),1:LINE-(0,0),1
1500     PAINT(2,1),1:GET(0,0)-(DX,DX),D12:CLS
1510 '
1520 '                          *** array filler ***
1530 '
1540 IF TEST=0 THEN DIM RA(20,100):TEST=1 ELSE 1680
1550 RANDOMIZE(8087):KN=0:SCREEN 0:WIDTH 80:COLOR COLA:CLS:LOCATE 10,21,0
1560 PRINT "Filling an array.  Sorry for the delay."
1570 COLOR COL1:LOCATE 12,33:PRINT "cells left to fill;":COLOR COL3
1580 COLOR COL1:LOCATE 14,33:PRINT "seconds remaining.":COLOR COL3
1590 FOR I=1 TO 20:FOR J=1 TO 80
1600     KN=KN+1:TOT=1600-KN
1610     LOCATE 12,28:PRINT USING "####";TOT
1620     LOCATE 14,30:PRINT USING "##";(INT(TOT*.05))+1
1630     RA(I,J)=RND*11+1
1640 NEXT:NEXT
1650 '
1660 '                          *** image producer ***
1670 '
1680 K=RND*19:KK=K:IF K+MF>20 THEN 1680
1690 SCREEN 1:COLOR 0,PAL:CLS:IF K+MF>20 THEN 1680
1700 LOCATE 3,9:PRINT "Hit <ESC> to start over"
1710 FOR X1=0 TO 318-DX STEP DSP:J=0
1720 FOR Y1=39 TO 198-DX STEP DSP
1730     IF INKEY$=CHR$(27) THEN SCREEN 0:WIDTH 80:GOTO 520
1740     J=J+1:I=RA(K,J)
1750     ON I GOTO 1760,1770,1780,1790,1800,1810,1820,1830,1840,1850,1860,1870
1760     PUT(X1,Y1),D1,PSET:GOTO 1880
1770     PUT(X1,Y1),D2,PSET:GOTO 1880
1780     PUT(X1,Y1),D3,PSET:GOTO 1880
1790     PUT(X1,Y1),D4,PSET:GOTO 1880
1800     PUT(X1,Y1),D5,PSET:GOTO 1880
1810     PUT(X1,Y1),D6,PSET:GOTO 1880
1820     PUT(X1,Y1),D7,PSET:GOTO 1880
1830     PUT(X1,Y1),D8,PSET:GOTO 1880
1840     PUT(X1,Y1),D9,PSET:GOTO 1880
1850     PUT(X1,Y1),D10,PSET:GOTO 1880
1860     PUT(X1,Y1),D11,PSET:GOTO 1880
1870     PUT(X1,Y1),D12,PSET:GOTO 1880
1880 NEXT:K=K+1:IF K>KK+MF THEN K=KK
1890 NEXT
1900 '
1910 '                       *** continue or end ***
1920 '
1930 LOCATE 1,13:PRINT "Hit ";Q$;"Q";Q$;" to quit"
1940 LOCATE 2,8:PRINT "or ";Q$;"P";Q$;" to switch palettes"
1950 LOCATE 3,6:PRINT "or ";Q$;"N";Q$;" to enter all new values"
1960 LOCATE 4,7:PRINT "or any other key to continue"
1970 C$=INKEY$:IF C$="" THEN 1970
1980 IF C$="P" OR C$="p" THEN PAL=PAL+1:COLOR 0,PAL:GOTO 1970
1990 IF C$="Q" OR C$="q" THEN LOCATE 1,1:END
2000 IF C$="N" OR C$="n" THEN 2010 ELSE 1680
2010 SCREEN 0:WIDTH 80:TEST=1:GOTO 520
```


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CIRCLE 239 ON READER SERVICE CARD

HARDWARE/COREY SANDLER

The tour begins with a visit to the realm of the fixed disk, followed by a gaze into the inner sanctum of the expansion slots, home of the elusive RAM . . .

IBM Drops The First Shoe

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CIRCLE 590 ON READER SERVICE CARD

IBM's PC-XT is something old, something new, something borrowed, and something Blue.

The old is IBM's continuance of the PC line, with the 16/8-bit technology of the 8088 microprocessor and the same line of separate monochrome and color/graphics display adapters. The new comes in the form of a 10-megabyte fixed disk and a redesigned system board with four times the capacity for internal memory. Still borrowed are the major building blocks of the PC, including the new fixed disk drive and a stunning new color monitor. But the real impact of IBM's first major expansion of its personal computer product line comes not from new technology but instead in the realm of marketing: Big Blue has reached out aggressively to claim an even bigger share of the market it

launched 18 months ego when it introduced the PC.

Not only hes IBM announced an ettractive edvanced version of its popular PC, but it has, in effect, dropped ell of its personal computer prices ebout 15 percent. Further, its new fixed disk drive end proprietary edepter employ a "tree" structure derived from e new DOS 2.0 end puts the IBM stemp of approval on e branch of technology different from that pursued by independent manufecturers in the past year. IBM's new color monitor offers a level of resolution and color separetion unmetched by other companies' monitors in its price range and well above.

IBM NOW officially supports expansion of the PC-XT internal memory to 640K.

IBM elso ennounced edapter cards and "black boxes" to allow connection of its populer 3278 malnframe computer terminels to PCs, e move thet should increese the placement of IBM microcomputer products in offices.

But Is It Compatible?

The PC-XT is said to be "downwerdly" competible with hardware end softwere developed for the PC. However, the inclusion of extra memory on the system board, an asynchronous communications adepter, an "officiel" IBM fixed disk, end e few extre expansion slots may heve en impect on the seles (or et least the designs) of the dozens of memory cards and "combo" cards sold by independent companies.

The base PC-XT system, priced et $4,995 at IBM Product Centers, features 128K RAM on the system board. One double-sided floppy disk drive and one 10-megebyte fixed disk drive are installed in the system unit. (DOS 2.0 ellows the user to formet double-sided disks et the previous density of 320K or with one edditionel sector for e totel of 360K.) Also included are the disk and disk edepter cards and the asynchronous adapter, which take up three of the eight expansion slots on the PC-XT (the PC has five).

IBM now officielly supports expansion of the PC-XT lnternel memory to 640K, using its availeble memory cards to add as much as 384K RAM.

Also announced were two expension units, one for the PC-XT and one for the PC. Wlth the expansion unit, either machine can support two double-sided disk drives and two 10-megebyte hard disks for a totel storege of nearly 22 millon charecters of informetion or the equivelent of ebout 11,000 double-speced typewritten peges. The PC-XT drives elso give the user a total of 12 available expansion slots; a PC with expension unit offers 9 available slots.

New Features

The PC-XT's system board now uses 64K RAM chlps lnsteed of the 16K chips that were stendard on the PC. (Interestingly, the memory chips on the PC-XT tested by PC Mogozine were all American-mede Texas Instruments devices, e change from the internetionel mlx used in most PCs.) The standard allotment of 128K takes up only half of the eveileble plug-ins on the board, allowing 256K without use of an expansion or combo card. The system board includes only one switch to indicete memory and options. The ell-but-neglected cassette port on the PC hes been dropped for the PC-XT model. A "color trimmer capacitor" has been edded to ellow edjustment of the RGB color output.

The power supply on the PC-XT drews 130 wetts, more then double the requirements of the PC's 63.5 watt supply. The edditional power is needed for the fixed disk end the three extre expansion slots. The PC-XT's fen and the fixed disk were elso notlceably noisier in operetlon than the original. The expansion unit inciudes its own power supply and fan.

The system board continues with 40K ROM, but these circuits have been redesigned to support DOS 2.0 end BASlC 2.0. The system now goes through a more involved "Power-On Startup Test" (POST), lncluding a segment-by-segment examination of system memory. A new diegnostics disk included with the Guide to Operations feetures greatly expanded tests (includlng the option to continue with start-up in most lnstances, even if the machine is reporting e feilure.) The diegnostics include e comprehensive test of the ections of joysticks and peddles thet might be ettached to the game edepter. A new section also allows testing of the fixed disk.

Six of the eight PC-XT expansion slots allow "full-size" cards; the remeining two speces are ebout half-length. The shorter locations could be used for game edepters or communications cards. The slots are slightly closer together than those on the PC, and "piggy-back" double boards may not fit in the PC-XT. Also changed is the design of the back slots. IBM will supply different mounting brackets for option cards purchased for use on the PC-XT. Independent manufecturers should elso be eble to offer the new breckets.

The PC-XT uses the same keyboard (with its strong points as well es its feults) as does the PC.

More Guidance

The Guide to Operetions has been expanded to include e full section devoted to the IBM 80 cps Metrix Printer and the IBM 80 cps Graphics Printer (first cousins to the Epson MX-80 and the Epson MX-80 with Graftrax, respectively.) The new section describes the varlous printer codes, including normal, compressed, emphasized and double-strike images, as well as subscripts, superscripts end underlines.

THE POWER supply on the PC-XT draws 130 watts, more than double the requirements of the PC's 63.5 watt supply.

The expansion units for the PC-XT and the PC come with one 10-megabyte fixed disk drive and eight expension slots. Six of the slots are full-length, while two will accept only shorter cards. One of the long slots is used by an adepter for the fixed disk drive and a second is used for e "receiver" card to communicate with the system unit.

The expansion boxes themselves are

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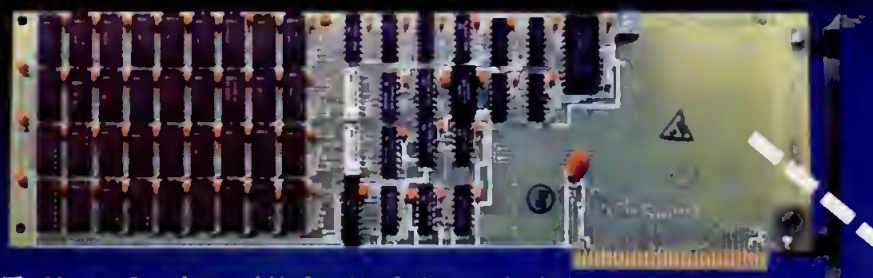
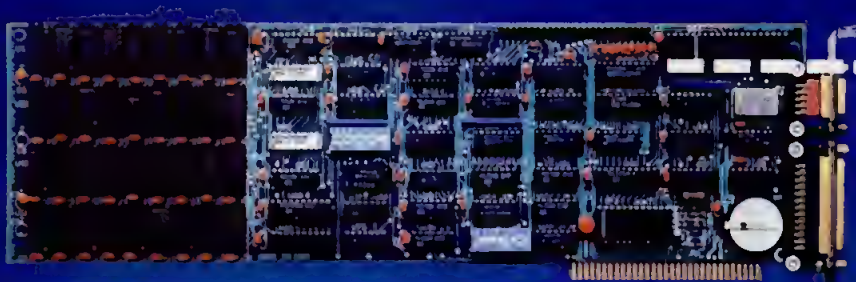


The Memory Board: Expandable, from 64KB for $275 to 256KB for $575.



The IDEAboard: Multifunction combination board. Memory up to 265KB. Options include serial interface, parallel interface (printer or SASI hard disk) and/or clock/calendar with battery backup. Prices range from $350 for 64KB with 1 option to $725 for 256KB with 3 options.

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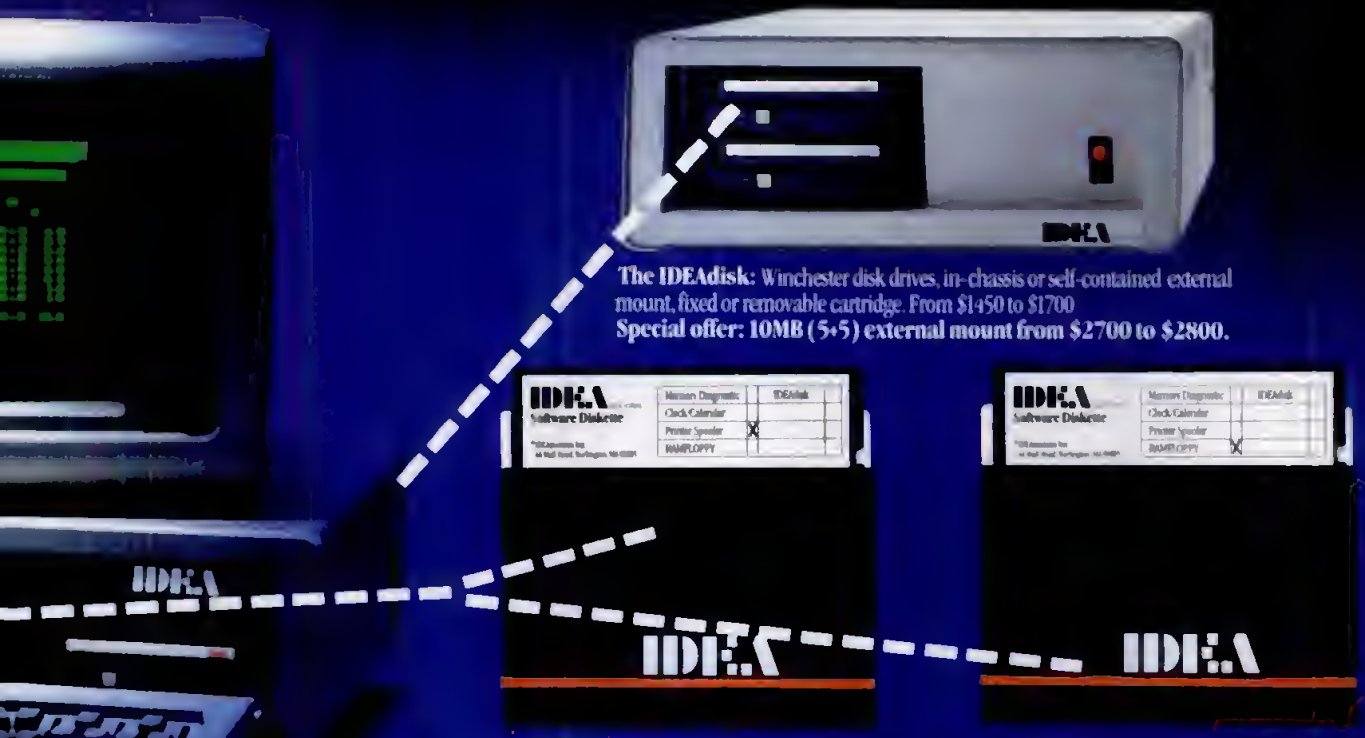

The IDEAdisk: Winchester disk drives, in-chassis or self-contained external mount, fixed or removable cartridge. From $1450 to $1700
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CIRCLE 333 ON READER SERVICE CARD

ldentical to the PC-XT freme. They ere 20 inches in length by 16 inches in depth and 6 inches high weighing in at 27 pounds. (The PC-XT with hard disk weighs 32 pounds.)

If you use en expension unit with your PC-XT, you must move your fixed disk drive and its adapter card from the system unit to the expansion unit. In place of the fixed disk drive adepter card in the system unit, you must install an "extender card," which has e ceble port to connect to the receiver card in the expansion unit. You are then free to edd e second double-sided floppy disk drive to the system unit, if desired. The unit comes with e 39-inch-long cable.

THE PC-XT'S fan and the fixed disk were also noticeably noisier.

The PC expension unit ellows you to add one or two fixed disk drives, leaving one or two floppy disk drives in the system unit.

Slipping a New Disk

IBM's fixed disks heve the same physicel dimensions and mounting procedure as the floppy disk drives end carry IBM's officiel blessing es "customer installeble." They offer 10,240,000 bytes of storage. The four surfeces of the hard disks spin at 3,600 rpm, and are divided into 17 sectors of 512 bytes eacb, with 306 tracks per surface. IBM claims a 90 millisecond averege access time for date and a 5 million bits-per-second transfer rate.

The drive in the PC-XT we examined was apparently manufactured by Seagate for IBM. Tbe motor wes made in Germany. Interestingly, the PC-XT *Hordwore Mointenonce and Service Monuol* includes drawings of a "Type 1" end a "Type 2" 10-megebyte fixed drive, perheps indicating that IBM bas had to go to two different suppliers to obtain sufficient quantlties of fixed disk drives. Type 1 has a rounded back and a power connector attached to the circuit board; Type 2 is e completely seeled box with its power connector at the end of a short cable. Ours was e Type 1. An IBM spokesman had no comment on the meaning of the two drewings ln the manual. Therefore, we must stick by our presumption that there are two different suppliers.

The fixed disk drive adapter (used in the PC-XT or either of the expansion units) features microprocessor-controlled 32-bit error-correction code, on-board sector buffers, internal diegnostics, DMA date transfer, automatic error detection and correction, and eutomatic retries on disk access.

In enother interesting difference, the double-sided floppy disk drive installed in the PC-XT we examined was apparently manufactured by the Control Date Corporation (CDC). Most of the early PCs used

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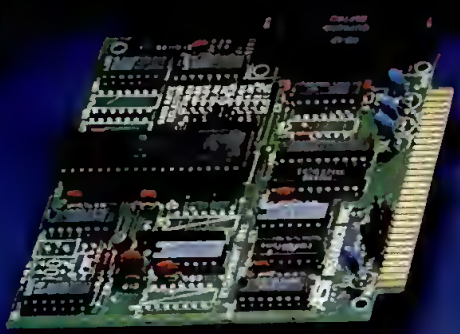

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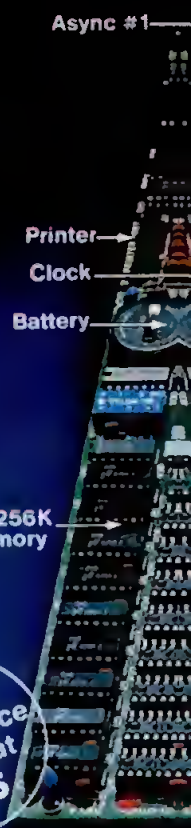

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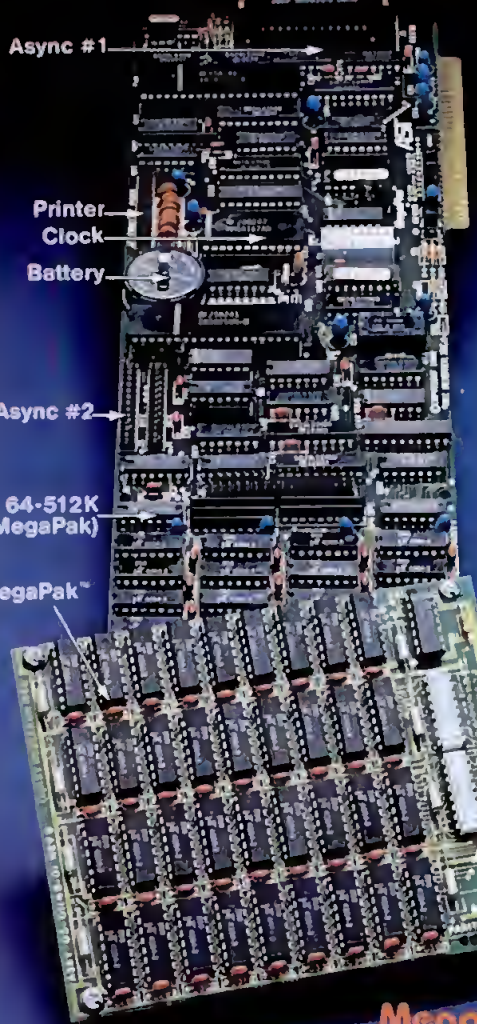

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Revised Figures

When IBM introduced the PC-XT, it also reconfigured the memory allotment—and price—of the PC.

As of March 1983, IBM stopped selling 16K PCs altogether. Its stripped down version of the PC now conteins 64K RAM, wbich fits neatly on the motherboard, with sockets for an additional 192K, just es on the PC-XT. The new 64K very basic system will sell for $1,355, e scant $90 more then the old minimum configuration model.

You'll still be eble to tell the difference between the PC and PC-XT motherboards. The PC version sports e cassette port, end six ROM sockets with an 8K chip snuggled into each. The PC XT lecks this port, and its two ROM sockets eacb hold a 32K chip. XT owners can fill eight expension slots; even with the new motherboard the original PC accommodates only five.

—Poul Somerson

A Word Or Two With Big Blue

IBM rarely comments—"speculates"—on coming attractions but is usually willing to discuss new products.

The following is on excerpt from a PC interview with Douglos R. LeGrande, held March 8, 1983 in New York. LeGrande is IBM Assistont General Manager for Operations, Entry Systems Business Unit, Systems Product Division in Boca Roton, Flarido.

PC: Twenty-two megebytes seems like e lot of storege for one user. When is there going to be a way for more than one user to get et thet storege?

LeGrande: It is our belief that es people find more end better uses for the storege evailable, they will begin to find thet they will be eble to use the storege in e very efficient wey. As for what will happen in the future, I prefer not to speculete on unannounced things.

PC: Why the price cuts on the originel Personel Computer line?

LeGrande: First of all, we have experienced some improvements in our cost structure and we want to pass elong those savings to our users. We feel thet we will meintein our position in the marketplece and be able to meet the customer demends over time. One of the things this reflects itself in is being competitive in our prices.

PC: A number of vendors are offering detabase management systems for the PC. Are you planning to introduce one of your own?

LeGrande: I won't speculete on unennounced tbings in this session.

PC: Is there a separate controller for the hard disk thet hard disks manufactured by other compenies can plug into? And, you seem to focus on telecommunications, but you use someone else's modem. Is IBM coming up with its own?

LeGrande: The ebility to attecb into this unit by other manufecturers is the responsibility of other menufecturers. There is a seperete controller, but it would be their responsibillty to make sure thet there's a compatible interfece. As for the second question, egein you are asking me to specvlete on e future product announcement, and I would prefer not to do thet."

PC: I want to be clear on whether or not existing PCs can be upgraded to the same level as the XT.

LeGrande: The maximum emount of computer internal memory that's availeble is 640K in both the PC and the PC-XT. You can put bard files and two 360 KJ floppies on both units. The difference that will come up will be, for exemple, in the power supply, on the mein systems unit, on the number of expension slots end on whether or not you want to add the asynchronous communications edapter or some of the other optional features [to the PC]. In terms of storage capacity, you can go from the PC up to the same amount of storage capecity as exists in the XT.

PC: "You're not offering a wey to add the hard dlsk lnto the systems unit on the PC?

LeGrande: "No. You add the expension unit. Thet's wbere both hard files would go on the PC. Wben you edd the expansion unit to the XT you move the hard file to the expansion unit, put both floppies into the XT and you also end up with more slots for optionel feetures."

Tandon disk drives. The CDC drive is physically similar, with two apparent differences: inclusion of an IBM logo on the bleck plastic front and a slightly different loading gate epparatus.

A Techni-Colorful Achievement

IBM's new Color Display drew meny oohs and aahs from the nontechnical crowd. Its high-resolution 12½-inch (diagonal) screen uses bleck masking for high contrast end direct drive RGB technology for colors. Top resolution is 640 by 200 pixels.

The display, which will sell for $680 et IBM Product Centers, can plug into the hooded outlet on the back of the PC-XT or the PC. It can produce 16 pure colors, including brown, light gray, dark gray end pristine white, four shades rarely seen on

THE COLOR unit is made for IBM by an unidentified manufacturer in Taiwan.

other "16-color" monitors. On the front o the displey are brightness and contres controls and an on/off switch. The unit i very similar in eppearance to IBM's monochrome displey, although slightly larger Like the monochrome monitor, the colo unit is mede for IBM by e unidentifie menufecturer in Taiwan.

For a technicel review of the PC-XT se "Inside The PC-XT" in this issue. A fin assessment—if such e thing is ever reell possible—is months, perheps yeers ewey It's already clear, however, thet the PC-X will not replece the PC. In fect, the ne 3278 "black box" interface (see "A PC I Terminal Clothing" in this issue) require not the PC-XT, but the PC. IBM is n ebandoning the PC. Before long, perhap by fall, we'll know how the market, whic is to sey, buyers end menufecturers— especielly software menufacturers—r spond. By then, last month's news may b old stuff. Our ettention mey heve turne to other goodies, peenuts end popcorn, t name a couple. /P

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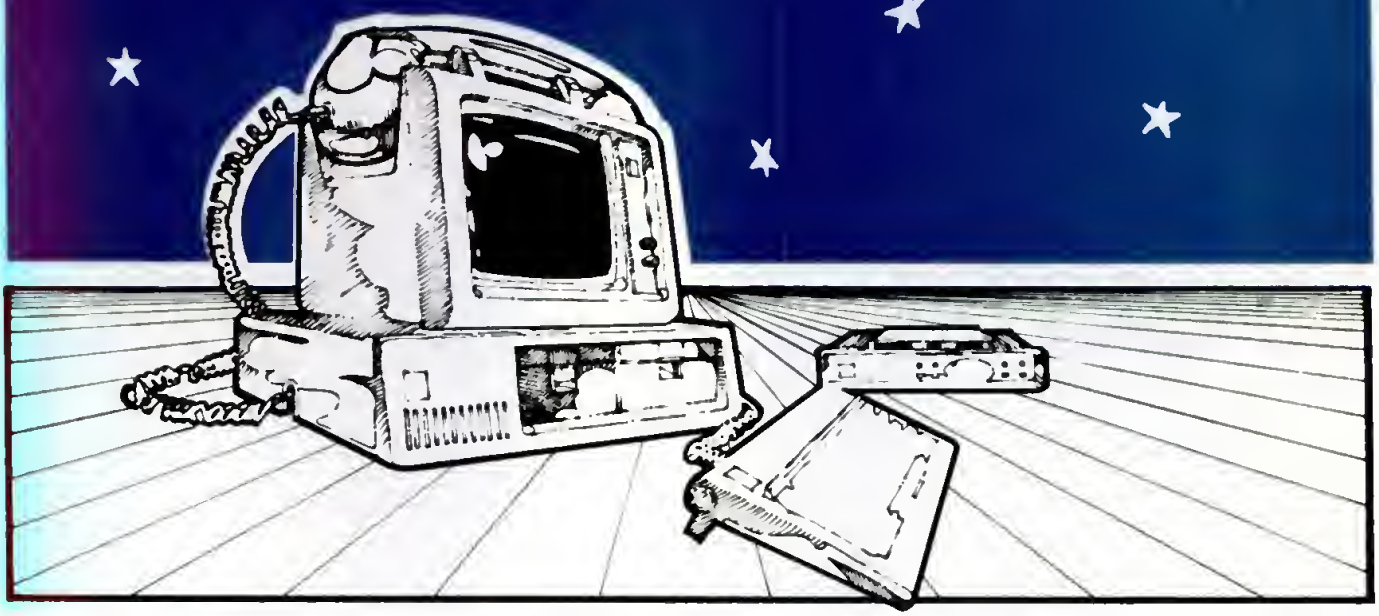

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IBM Personal Computer with 128k, at least one diskette drive, 80 column monochrome or color monitor, and a Hayes Smartmodem or Novation Smart-Cat. Printer is recommended.

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IBM extends its Personal Computer line with a new machine calculated to raise the interest of the business community, not to mention just about everyone else.

Inside The PC-XT

There it was, a shiny new IBM PC-XT, fresh from its press introduction in New York. Sitting next to it was a red toolbox, end my job wes to delve into its innards, in order to evaluate the technical changes. Momenterily deunted by the pristine newness of the mechine, I took just e moment to admire the new color monitor. Before many more minutes had passed, the machine was in pieces on the teble, et least some of its secrets leid bare.

Pundits and prognosticators have been second-guessing the introduction of this mystery machine for months. Many anticipeted the much discussed "Peenut" or "Popcorn"—or even the rumored "PC II." The newest eddition to IBM's family of Personel Computer products turned out to be none of these. In fact, the XT is more noteble for what wesn't changed than for whet wes. Its central processing unit (CPU) is still en 8088 running at 4.77 MHz. So much for the predictions of higher clock speeds and an 80186 processor. The large scale integration (LSi) support circuits on the system board remain unchenged. There is no battery-backed-up clock as some hed predicted.

The most obvious change is the number of expension slots—eight insteed of the limiting five. Two of them, tucked as they are behind floppy Drive A, have room for only "shortie" boerds like the esynchronous communications adapter. Slot 8 hes one other change: it "expects" (IBM's word) thet the board plugged into it will respond with the "cerd-selected" bus signal when the boerd is selected. Only boerds meeting this condition will work in slot 8. This is not e requirement of the other seven slots. The bus drivers cen hendle up to 16 low-power Schottky (LS) loeds, two per board. Since nearly everyone is using LS TTL logic chips these deys, there is little chance of overloading the bus. You do not heve to worry ebout overloading the power supply, as it is upgraded to 130 wetts, double the PC reting.

Some obvious changes have been made to other areas of the system board. The row of ROM chips thet contained BASIC is gone, replaced by a single chip. Sitting

The new COMPAQ Portable Computer. IBM compatibility to go.

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If you use a portable typewriter, you can use the COMPAQ Computer as a portable word processor instead.

If your company already uses the IBM Personal Computer, add the COMPAQ Portable as a mobile unit that can use the same programs, the same data disks, and even the same user manuals.

There are more programs available for the COMPAQ Computer than for any other portable. More, in fact, than for most nonportables. You can buy them in hundreds of computer stores nationwide, and they run as is, right off the shelf.

With most other portables you'd probably need to buy an additional display screen because the built-in screen is too small for certain tasks, like word processing. The COMPAQ Computer's display screen is nine inches diagonally, big enough for any job, and it shows a full 80 characters across. And the built-in display offers high-resolution graphics and text characters on the same screen.

The bottom line is this. The COMPAQ Computer is the first uncompromising portable computer. It delivers all the advantages of portability without trading off any computing power capability. And what do those advantages cost?

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The COMPAQ Portable sells for hundreds less than a comparably equipped IBM or APPLE® III. Standard features include 128K bytes of internal memory and a 320K-byte disk drive, both of which are extra-cost options on the IBM. Memory and additional disk drive upgrades are available options to double those capacities.

In the standard configuration, the COMPAQ Computer has three open slots for functional expansion electronics as your needs and applications grow. It accepts standard network and communications interfaces including ETHERNET™ and OMNINET™.

If you're considering a personal computer, there's a new question you need to ask yourself. Why buy a computer that isn't portable?

For more information on the COMPAQ Portable Computer and the location of the Authorized Dealer nearest you, write us. COMPAQ Computer Corporation, 20333 FM149, Houston, Texas 77070. Or call 1-800-231-9966.

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next to it is enother chip thet conteins the BASIC input/output system (BIOS). The two ROM sockets cen handle either 8K by 8K or 32K by 8K chips, for e totel of 64K ROM. In this cese, BASIC is in e 32K chip end the BIOS is in an 8K chip. Meybe it's too obvious a question, but why didn't IBM put BASICA end the BIOS in e second 32K chip end meke it the defeult BASIC? The best news about the system board,

THE BEST NEWS about the system board is the use of 64K dynamic RAMs instead of the previous 16K chips.

however, is the use of 64K dynamic RAMs instead of the previous 16K chips. Meny felt thet the PC should heve been designed with these chips in the first plece, but they're here now and they're great. 256K capecity on the mein boerd is pert of whet the XT is ell ebout—eXTended cepebility. Few will miss the cassette port, which has been eliminated in the PC-XT.

A Fix on the Disks

Moving to the floppy disk, our semple mechine was equipped with e Control Dete Corporetion (CDC) dual-sided drive, giving 320K storage per disk. Why didn't IBM use one of the proven 96 treck-per-inch drives like CDC's 9490T, which would give 700K usable spece per disk? Only IBM knows. . . . Don't get me wrong, 320K storage is swell, but this configuration requires 30 or so floppies to back up e fully-loaded "fixed" disk, es IBM calls its version of the Winchester.

Speaking of the fixed disk, our XT hed e Seegate 10-megebyte drive. It's known to be e rugged unit; I liked the sticker that cautions you against subjecting it to greeter then 20 G shocks. IBM's Hordwore Mointenonce and Service Monuol describes e "type 1" end e "type 2" hard disk; IBM has cleerly made provisions to second source the herd disk.

A Winchester disk drive is only es good es its controller, and IBM's controller looks es good as anyone could wisb. It hes its own on-board microprocessor end enough memory to buffer e sector from the hard disk. It uses the system board's direct memory eccess (DMA) capebility to trensfer dete to and from mein memory. It relies on one of the interrupt levels to meintein e high speed. There is some innovative technology on this cerd, as evidenced by the "Patents Pending" legend etched onto the circuit board. It feetures 11-bit burst error detection end 32-bit error checking end correction. Like the 9-bit wide mein memory, the empbasis is on minimizing the chance for errors. All in ell, it is designed to use the 8088 as little es possible, keeping program throughput high. You won't have to weit long to pley your fevorite game in Advenced Besic. BASICA loeded from the fixed disk in 0.8 seconds, fast enough for most epplications. Peachtext loeded from the hard disk in 2.3 seconds.

Signals from IBM

PCs heve been snepped up by the business community et en ewesome rate, but the XT is whet business people reelly needed eil along. No executive should heve to pley the floppy disk shuffle. I, for one, object to eny mechine thet cannot think es fest as I can. And this is exectly whet happens in the floppy disk environment when the program you're using goes out to disk for enother overlay before it carries out your latest instruction. The peuse breaks your concentretion, mekes you wonder if you pressed the right key, end perheps ceuses you to lose a critical thought. Hard disks obviete these objections by responding meny times fester (and silently) to your commends. The XT is much closer to being e professionel's personel work station than the PC ever wes. Now thet the hard disk is eveilable es en IBM-integrated package, the popularity of this mechine is assured.

IBM hes signeied this new role loud end clear with the introduction of the serial deta link control (SDLC) Adepter board. This is the boerd that puts the PC, with appropriete software, on-line to IBM's meinframes. SDLC reflects IBM's opinion of how synchronous communications should be handled. It is implemented on this board with tbe Intel 8273 SDLC controiler. Telecommunications engineers ere usuelly e steid lot, but they tend to wax eloquent over devices like the 8273. It is reelly e dediceted microprocessor that specielizes in synchronous date communicetions. Again, this frees the PC CPU from onerous tasks such es monitoring the communications line for e veriety of hendsbaking signals, block control charecters, end other details. In eddition, the board holds an 8255 PPI chip, which provides full control over the modem. It provides for deta rates up to 9600 beud.

The Hordwore Mointenonce ond Service Manuol, like the rest of the documentetion, is superb. It covers every conceivable failure the XT is likely (or unlikely) to encounter. It is organized into flowcherts and decision trees thet take you from eech test end error message to the proper diegnostic ection necessery to isolete the feult. The sum totel of speciel equipment required is e volt/ohm meter end an IC puller. Repeirs are oriented to replecement of sub-units rether then troubleshooting the logic.

The color monitor eccepts red-green-blue (RGB) inputs for maximum resolution. Its resolution is sufficient to displey 25 lines of 80 characters. IBM is

REPAIRS ARE oriented to replacement of sub-units rather than troubleshooting the logic.

touting it as good enough for word processing, but the resolution is still inferior to that of the monochrome monitor. It is especielly irriteting in the default white on bleck. You cen see the shedow mask in the white cheracters. Editing in one of the colors is far eesier on the eyes. You do have to patch your text editor to output the instruction for the color you desire. Other than thet, the color performence is excellent.

In conclusion, the PC-XT is just what the original PC should heve been: an effordable full-capability business computer with (nearly) state-of-the-art technology. */PC*

Bill Mochrone is o New York City computer consultont ond technicol writer.

IBM's new disk operating system supports PC-XT hardware features and delivers pipes, filters, and trees to everybody.

DOS Marches On

A chenge in the operating system varsion number to the left of the decimel point is supposed to be a big daai. And DOS 2.0 is indeed a big deal. You can teii how big by just looking et it: the manuel ls feirly bursting out of its ring binder. However, you probably won't have to read the whole manuai. Much of it is devoted to fairly advenced programming information, and what IBM cells "minor operationai and technicai differences from previous versions of DOS."

Documentation

If you do decide to lay your $60 down for DOS 2.0, whet will you get? First, the manuel features a new Chapter 3 (called "Using DOS") that covers elementary oparations such as working with disks, obtaining directories, displaying file contents, changing a file name, removing a file, and adjusting the video display onscreen. Richly illustrated and clearly written, it serves es an excellent introduction to the basics. Though much of its content is borrowed from the originei Chaptar 3 of the *Guide to Operations*, this useful informetion is now more digestible end bettar integrated into the beginner's learning process.

New Features

DOS 2.0 arrives on two single-sided double-density disks and features a nine-sector disk format, which increeses data capacity by ebout 20 percent. Formet incompetibility is not a problam since tha new DOS can recognize and read the oid eight-sector format. Other new features include a configuration file, multiple disk buffers, end extended screen end keyboard control. Other companies will no doubt soon begin designing software that will take full advantage of these capabilities.

Other special features include the Print and Graphics commands. Print is an onboard print spooler that allows you to print a list of files while doing other things with your PC simultaneously. The Graphics command allows you to copy a graphics image from the screen to your printer. This works weli with both the IBM printer and the Epson iine of printers, providing shaded renditions of anything you can get to the screen, including colored pia charts.

Hard Disk Support

DOS 2.0 offers considerable support for disk drives. Although the literature mentions thet it is specifically suited for the IBM, the DOS 2.0 system features facilities and hooks that can support hard/cartridge disks of all shapes and sizes. Disks no longer have to patch themselves into

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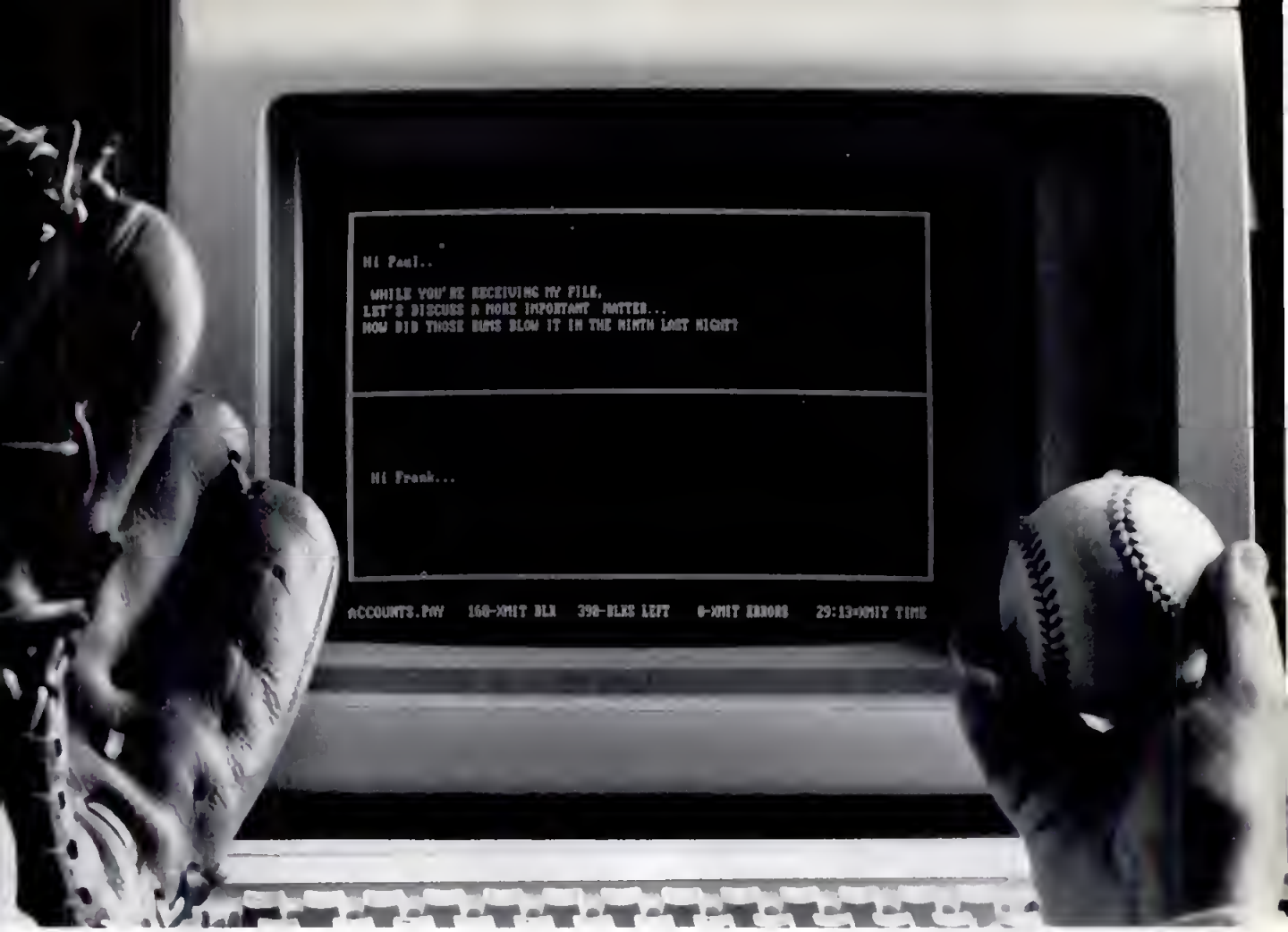

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Figure 1: A sample tree-structure directory. The backslash (\) is used to denote the root directory of the tree. (It's at the top; by convention, trees are drawn upside down.) Circles represent directories, and the lines connect each directory with its contents—files and other directories.

To lead DOS to a particular directory, you show it the "path" from root to destination, using the CHDIR (CHange to DIRectory) command. In a sequence, directory names are separated by backslashes. For example, if you want to get down to Midwest sales, you type CHDIR\marketing\sales\midwest. Now you can deal with Jones, Smith, etc., in the same manner as in earlier DOS versions.

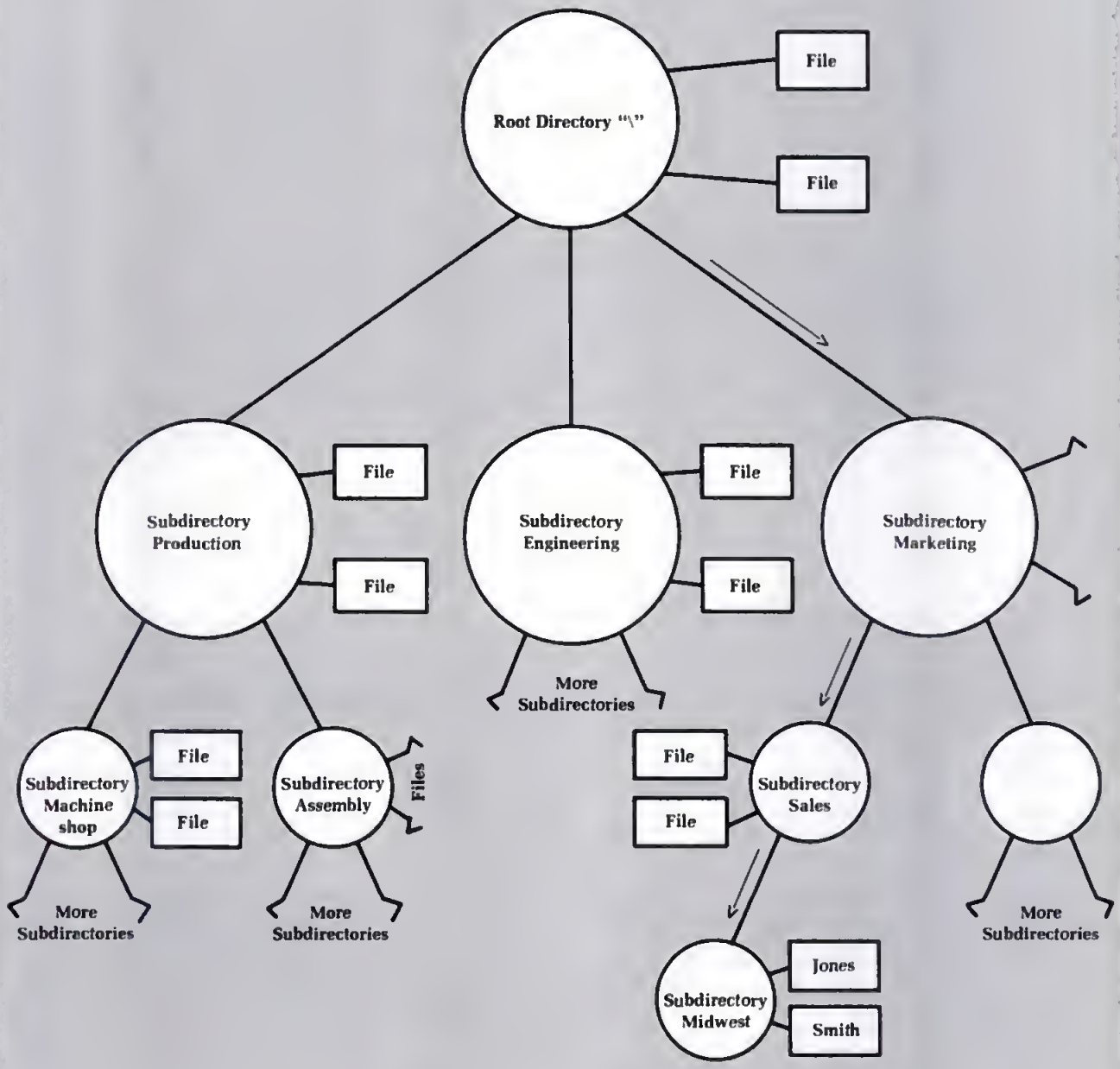

Figure 2: New DOS commands that control tree-structure directories

SYNTAX	EXPLANATION
MKDIR poth	Make (create) a new subdirectory within the current directory
CHDIR poth	CHange to a new DIrectory (This command leads DOS down the path to the directory you desire.)
RMDIR poth	Remove (erase) the specified directory, Including eii of its files, subdirectories, and files In the subdirectories
TREE volume [/F]	Give a report on the tree structure (end files) of the specified volume
PATH path!; path	Tells DOS where to look for commands, batch files, etc., if they cannot be found in the current directory

the system; they can now serve as lagitimate assigned davicas. This means that your RAM disk will not interfere with your herd disk. In the future, this may mean thet es soon as naw devicas ere invented end marketed, thay can be smoothly intagrated with your systam.

To install a hard disk, you use the FDISK fecility. It ellows you to partition the disk into separata arees, several of which are reserved for DOS, and several that are resarvad for CP/M or other oparating systams. You cen than switch beck and forth emong these es you wish. At almost any tima, you can change partitioning to suit changing conditions.

Backup, Restore, and Assign

Two naw utility commands, Backup and Restore, work together to simplify file copying. Beckup allows you to copy selected files from a hard disk to a backup disk. With this command, you can beck up e specific file, a directory of files, (plus all its subdirectories), files modified since tha last backup, or files written since a specifiad data. Restore, tha counterpart of Beckup, allows you to restore the contents of the hard disk from the disk producad by Backup. The Assign command ellows you to tell the system to treat one drive as if it were another temporarily. This makas it possible to move overleid progrems to e fixed disk. Although the systam will still try to retrieve the overlays from driva A, DOS 2.0 will jump to the right plece.

IF THE TRUNK, limbs, branches, and twigs of a tree were labeled, you could follow any path from root to leaf by taking the correct turn at each fork.

Volume Labels

Havan't you wishad that your disks could beve their own computar-readebla labels in addition to the stick-on kind thet you use to help sort your stacks of accumulated disks? DOS 2.0 makas this possible. Using the Format command, you can give eech disk e volume lebel. A supplementary command (VOL) can also be used to list the volume lebels given to your disks.

The idea of volume is not restricted to floppy disks; fixed disks cen heve volume labels too. In fect, in this articla, I will not talk about floppy disks and fixad disks separately. Instead, I'll refer only to "volumas," disregarding details of the medium. Hidden in this seemingly innocuous ebstrectlon is tha seed of an idea centrel to ell modern operating systems: the "virtual" file—ona whose storage medium is irrelevant to the user and to the epplicetion.

Tree-Structure Directories

Most of us seem neturelly inclined to assign things to groups or classas and organize tham into hierarchies. The femily tree end the corporate organization chert are examples. Big problems such as organizing a businass or an engineering project—or e herd disk with 1,000 filas on it—demand this kind of thinking.

One of the most interesting end useful feetures of DOS 2.0 is its ability to create a tree-structure organization in which tha files are erranged in hierarchies of directories and subdirectories. Instead of having only one directory per volume, you cen create a separate subdiractory for eech successive file. Figure 1 illustratas this procedure and shows why the word "tree" is eppropriate.

Planting the Tree

If the trunk, limbs, branches, and twigs of a tree were labeled, you could follow any peth from root to laaf by taking tha correct turn et aacb fork. In the tree structure, evary directory bas e label, and you nama succassiva onas as you laed DOS elong the peth to tha one you want. Once there, you cen deal with the files in the subdirectory es if they were the only existing ones. Creating new fila namas is a trouble-free procedure sinca they need only be unique within specific sub-directorias. In this wey, you can use simpla, logical names instaad of the complex names that would normally be required to distinguish ona file from among sevaral hundred. Although eech file hes e long neme—the whole path to its subdirectory plus its local nama—onca you reacb the subdirectory all you have to worry ebout is tha local fileneme. Figura 2 lists the new DOS 2.0 commands that daal with tha tree of directories. Using thesa commands, you can meke (MKDIR) e new subdirectory within the one you're presently in, remove (RMDIR) an old directory (dalete the directory and ell its subs), change to (CHDIR)—meening move to—e new directory, or ask for a report (TREE) on tha

DOS 2.0 arrives on two single-sided double-density disks and features a nine-sector disk format, which increases data capacity by about 20 percent.

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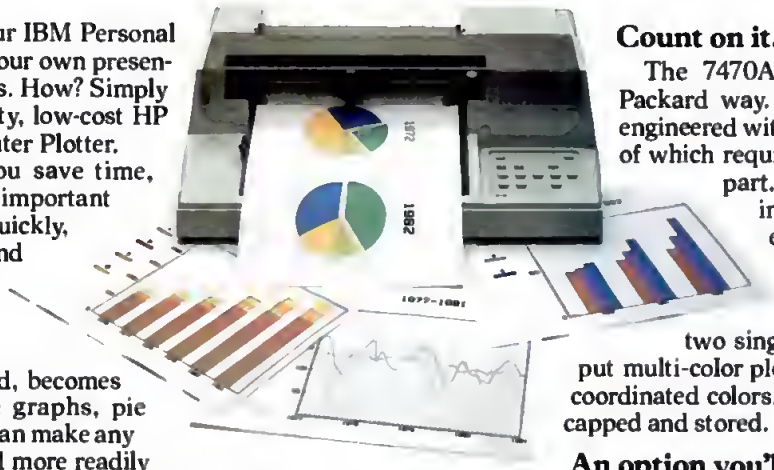

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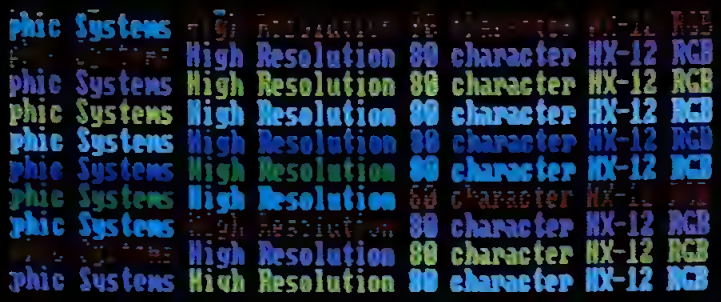

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tree structure of a given voluma.

Another advantage of tree-structure directories is that thay allow you to kaep a greater numbar of filas on a disk; this mekes it difficult to run out of directory space.

Tha major disadvantage of tree-structure directories is that they cannot be treated the same as othar files. Under DOS 2.0, you cannot Rename or Copy a directory.

Paths

Let's take a look et a releted commend, and one of my favorites: Path. I constantly forgat what fila is in wbich drive. Consequently I'm alweys getting the heted "Bad command or file name" massage. The Path command allows me to give DOS 2.0 e list of altarnete directories in which to look for commends or files.

Figure 3: A list of new botch stotements used in DOS 2.0

SYNTAX	EXPLANATION
arguments (%1, %2, etc.)	Same as in DOS 1.1
ECHO [ON|OFF] . . .	Suppresses or allows screen messages
FOR %% variable **IN** (set) **DO** command	Causes DOS to execute command over and over for each value of %% variable listed in sat (between the parentheses)
GOTO label	Tells DOS to execute the command on the line after :label
IF [NOT] condition command	Tells DOS to execute command only if condition is [not] true: otherwise ignore tha command
:label	The destination of a GOTO
condition	(1) An ERRORLEVEL = number; returned from BACKUP or RESTORE (2) A string comparison, i.e. string 1 == string 2 (3) An inquiry: EXIST filename, as to whether filename is defined in tha current directory
SHIFT	Allows a batch to have arguments beyond %9

RECOVER reads a given file sector by sector, reconstructing the good sectors and skipping over the bad ones.

File-Oriented Utilities

DOS 2.0 faetures two fila-oriented utilitias, RECOVER and COMP. RECOVER reads a given file sector by sector, reconstructing the good sectors and skipping ovar the bad onas. Although you may lose some sectors, you won't lose the entire fila.

The COMP utility, however, is e big disappointment. Instead of listing the differences line by line between a pair of ASCII files, it only reports thet the files are different sizes—information you've elreedy obteined from a DIRectory listing. If the files being compared are identical in size, COMP will report the Hex offsets to Hex differences batween them. Since it doesn't try to resynchronize the files after a difference, just one byte added to one of the files will disrupt the entire procedure. Fortunately, COMP will stop after ten mismetcbas. It saams that COMP is only useful for verifying copies of files, a function alreedy accomplishad by /V in Copy.

The EDLIN Editor

EDLIN is the beneficiary of some significant improvements in its new releasa on DOS 2.0. It faatures three new commands, ell releted to blocks of text. The Copy command allows you to duplicete e block of lines as many times as you wish and in whatever locetion you desire in tha edit file. The Move command allows you to mova a block from one place to another in the edit file. Tbe third command, Transfer, ellows you to read the contents of e file into tha edit file at a chosen point. Unfortunetely, Transfer cannot be usad to perform the reverse, to write a chosen block out to a fila.

Batch Files

One of the most importent idees in computing is that the user, in performing a tesk on the computer, should be spared es many of tha details as possible. Most of the work should be eccomplished by e task force of utilities, notably batch files. Their name suggests their mein purpose, which is to batch togethar DOS commends to be executed collactively. In DOS 1.1, a batch fila is limited to a list of DOS stetements to ba executed in strict sequence. In DOS 2.0, its range has been expendad to includa statemants that label blocks of commands, choosa blocks of commands based on certain conditions, and reiterate commands over sets of variable values. Figure 3 lists tha specific statamants used. Thase new statements give you power to write betch programs thet will do elmost enything you wish.

If you are an applications-oriented user, you might not appreciete this feeture since you probably don't want to write any programs. You might benefit, howevar, if software compenias begin to take advantage of this upgraded fecility. In time, they may be able to creata batch files tbat will make it easier for you to install thair products and more conveniant for you to run them.

Standard Input and Output

The two principal cbannals of communicetion between you and your progrems ere the keyboard (standard input) and the video displey (stendard output). It is helpful, however, to think of thase two more abstractly—as virtual davicas—tha keyboard es "Stdin," the video as "Stdout." Any program that receives most of its instructions and data from Stdin, and sands most of its results to Stdout, can be used as e building block with others that operate in the same manner. The Stdout of

EDLIN IS the beneficiary of some significant improvements in its new release on DOS 2.0.

one progrem can be trensformed into the Stdln of the next, and so on, until these smaller modules eventually form one large program. The concept of flexible I/O is the foundetion of two more complex procedures: redirection and pipes.

Redirection of Standard I/O

Actually, you've been practiclng redirection all along without ever giving it much thought. You redirect output eech time you press PrtSc or Ctrl-PrtSc; the former redirects a snepshot of Stdout to the printer, and the letter redirects ell of Stdout to the printer one line et e time.

In DOS 1.1, the Mode command gives you the option to redirect ell printer output from a program to the asynchronous edepter. By connecting the pipe out of PrtSc to the pipe set up by the Mode commend, eny output sent to the screen goes on your esynch line—resulting in simple, extemporaneous telecommunications.

In DOS 2.0, the redirection of standard input and standard output has been made a generel principal of operetion. The redirection feeture allows almost eny program to receive its input from a source other than the keyboard end to direct its output to e destination other than the screen. Sources and destinetions can be files of your choice or any of the standard character devices, such as CON:, AUX:, COM1: or COM2:, PRN: or LPT1:, LPT2: or LPT3:, or NUL:. Using DOS 2.0, you can redirect

IN DOS 2.0, THE redirection of standard input and standard output has been made a general principal of operation.

the contents of a file as canned input to e program thet would otherwise require you to type in the contents of that file. You can also redirect the results of a tree command to e file end edit those results to produce e permanent annotated catelog of e volume's contents at the end of e project.

Redirection is a big step toward meking your PC into e virtuel worktable at which you cen do enything you want to eny text or image you can creete or otherwise ecquire.

Pipes

In my opinion, the distinction between redirected stendard input/output (I/O) and pipes is unnecessary and obscures the fundamentel issue: thet any program or device should be eble to communicate with eny other program or device without undue concern for the medium used. Nevertheless, in DOS 2.0, the distinction exists; you redirect standard I/O to files and devices, but you pipe stenderd I/O among programs. The result is the same either way.

Using DOS 2.0, you cen pipe the Stdout of one progrem into the Stdin of enother and run them in tendem to accomplish some larger task. This allows you to look et programs as tools and to look at e set of programs as e tool box. You choose the proper tools end use them together in the wey thet will best eccomplish the work at hend. DOS 2.0 brings you another step closer to the virtual worktable; it allows you to trensfer informetion to e drawer full of virtual tools.

Filters

A program that has been specially designed to work with redirection and pipes is called e *filter*. The term comes from electronics or plumbing; e filter refers to something thet creates a desired change to a stream when it passes through the filter. In the same way, e filter progrem changes the stream of dete thet passes through it. It reeds dete from Stdln, chenges it in some wey, end writes the results to Stdout. Filters usuelly perform only one elementary operation on the data stream. Combined filters are requlred to effect significant change in the stream.

If we go back to the idea of the virtual worktable, Stdin and Stdout are the work surfece; redirection end pipes control the stream of dete; and filters are the tools in the drewer. IBM hes provided e "sterter set" of filters in DOS 2.0. These are celled Sort, Find, and More.

Sort, Find, More

Sorting is commonly used to organize information. If you can arrange to pipe a data stream to the Sort filter, you can sort it without writing a speciel progrem. Sort reads a data stream from Stdin, sorts it on the requested field, and writes the result to Stdout. For example, suppose you want to produce a time-sorted catalog of the files in e disk volume. You would pipe the DIRectory report to the Sort filter and redirect the result to the printer or to a file.

Suppose you have a number of text files, eech e chepter in a large report or

IF YOU CAN arrange to pipe a data stream to the Sort filter, you can sort it without writing a special program.

book you're writing. You want to find every reference to e table or figure so that you can verify them with the art department. Although you could loed each file into your word processor end do e global search, this would involve tedious, repetitive work with a greet deal of overhead. If you use the Find filter, however, your work will be much easier. Find searches a sequence of files for e given string value and reports the results to standard output with minimum effort. It will then filter stendard input, reporting each line that contains a specified string to standard out,ut.

'-uppose you want to produce a quick date-sorted report thet will list the purchase orders for Acme Trucking. To eccomplish this, you could run Find on a set of files containing purchase orders to filter for those belonging to Acme Trucking, pipe the result to Sort, then redirect to a file.

When DOS 1.1 added the /P option on the DIRectory command, I immediately tried the same option on Type to see if it would work there, too. It didn't, since the facillty wasn't general. DOS 2.0, however, feetures the More filter, which reads data from Stdin and sends one screenful et a time to Stdout—presumably the screen. More is certeinly not an exciting feature, but it is useful. For exemple, lf you want to preview the Acme Trucking report before printing, you can run the file through More to see it e page et e time without key-

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ing in Ctrl-NumLock to stop the screen from scrolling.

It seems thet these three filters are only the beginning. Soon, IBM and independent compenies will undoubtedly be eager to market filters for simple calculating, sorting and merging, text-pettern recognition, formatting, plotting, business graphica, mecro processing, end more. Your drawer of tools will probably grow to suit your personel needs.

THE CTTY command allows you to connect a foreign terminal to the PC, giving it the identity of standard input and output for redirection.

New Screen Facilities

DOS 2.0 features several new facilities that can help make your video screen more flexible: CLS, ECHO, and PROMPT. All three ere DOS commands thet you can invoke from the normel DOS prompt.

CLS ellows you to clear the screen at the DOS prompt. Although this doesn't seem like much, think ebout it. How many times have you wented to get rid of clutter? Or rest your eyes by moving off thet bottom line on which DOS elweys seems to settle? Or zep some incriminating materiel when someone starts peering over your shoulder?

ECHO seems especielly useful for system integretors; it can keep irrelevent DOS messages from appearing on the screen. When e batch file is used to autemete a procedure, you may find it difficult to determine which of the messages appeering on the screen is meant for you. ECHO permits you, the batch author, to control whet goes to the screen so that the user sees only the messages intended for him.

The DOS prompt thet tells you the current default drive hes elweys been either A>, B>, or C>. In DOS 2.0, the Prompt command ellows you to substitute other things, such as the time or dete, for the drive letter or for the > symbol. Substituting the current defeult directory—option P (for peth)—causes the prompt to display the actual peth to the current directory. This is very helpful when you're leerning to use tree-structure directories since you will always be able to tell where you are in the tree.

New Keyboard Facilities

The Ctrl-Break key allows you to abort a program; however, since it is only tested at certain points during e program's tenure, some progrems (mostly compilers) could not be eborted because those points were never reeched. The Break On command in DOS 2.0 increases the chances thet en abort will take plece by telling DOS to check Ctrl-Break et more frequent intervels.

The CTTY command allows you to connect a foreign terminal to the PC, giving it the identity of standard input and stendard output for redirection. This seems to be enother indication thet DOS is growing up and becoming less parochiel about attachments.

ANSI Escape Sequences

The Americen Netionel Stendards Institute (ANSI) hes published specifications for a set of standardized escape sequences thet progrems cen use to control virtuel keyboards and screens (Stdin and Stdout). These sequences serve es e programmer's tools, heiping him to create more porteble software by treating devices as ebstractions and leaving the details of specific devices to the operating system.

DOS 2.0 hes edopted some of these escape sequences. Stenderd output (the screen) will now accept them to position and move the cursor, set video attributes, end erase ell or part of the screen. Stendard input (the keyboard) will eccept escape sequences to map the keys to different characters or to cheracter strings. It seems that 10 to 15 different keys can be remapped, each to a 10-character string, end that more keys can be remapped if the strings are shorter. I found it difficult to determine, however, because when I tried to use this procedure, the system feiled. This seems to be the weekest feeture of DOS 2.0.

Programming Facilities

Debug has been improved substantiel-ly by the eddition of e conversational assembler. Although it can't deel with labels end symbolic names, it certeinly can handle e MOV DX, [BX+SI] fester then you probably can! The Link progrem, however, is a big disappointment. There is still no way to obtein e useful Mep of e complicated multi-object progrem, and there is still no librery meneger.

The DOS 2.0 manual, however, does tell you how to port your compilers over to hard disk. This procedure, which appears to be thoroughly documented, requires various patches. Since compilers are large and produce lerge intermediete files, this should be e significant operational convenience. It does not speed up compilation or assembly, though, beceuse compilers are compute bound, not I/O bound.

Device Drivers

Perhaps the most important internal chenge in DOS 2.0 is its ebility to instell devices into DOS in a systematic, disciplined manner. (Chepter 14 of the DOS 2.0 manuel provides a thorough explenetion of how to build device drivers and instell them.) The CONFIG.SYS file is the key to setting up a hardwere configuretion et boot time. Using this file end a device driver, ettachment manufecturers can integrate their devices into the system easily, circumventing the free-for-all etmosphere thet existed previously. In my opinion, all devices should coexist in this way rather than compete for resources.

DOS 2.0 FEATURES several new facilities that can help make your video screen more flexible.

DOS Internal Function Calls

DOS 2.0 has elmost doubled the repertoire of internal function calls—good news for software developers. If the developers begin to standardize their progrems to suit these facilities, it could be good news for you end me too. It's much eesier and more productive to use a set of programs thet operete in e similer fashion and

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serve as task forces, such as the filters discussed above.

Probably the most interesting feature of the new internals repertoire is its strong multi-tasking orientation. Files can now be assigned handles and treated more abstractly. Disk transfer areas can also be swapped and managed (DOS won't do this for you yet, but the elements are there for you to do it yourself). Soon, perhaps, we may actually be able to share files among active tasks.

DOS also contains internal function calls that can allocate and free memory. They can also spawn subtasks and control and monitor their operation. Appendix F and Chapter 10 of the manual even show how to invoke secondary copies of the DOS command kernel itself. This could be the start of genuine multi-tasking in the IBM PC. It will take time to find out.

ONE OF THE BEST features of DOS 2.0 is that it can support some non-IBM devices.

To Buy or Not to Buy

The question arises: Should you buy DOS 2.0 or keep your DOS 1.0 or 1.1? What are the rewards or penalties of upgrading or standing still?

Some users should not upgrade. If you run a 48K to 64K machine, for example, don't invest in DOS 2.0. It requires about 25K RAM and is almost certain to crowd your present programs out of memory. If you've become accustomed to a multifunction board with a clock/calendar, RAM disk, and spooler, don't rush out to buy DOS 2.0 yet. Manufacturers of attachments will probably publish updates for their interface software soon, and you should wait. If you have a hard/cartridge disk, IEEE 488 boards, or non-IBM color graphics boards, the same applies. If a program needs a DOS patch at installation, it won't run with DOS 2.0 until the manufacturer reworks the software.

Compatibility

Before you decide to buy DOS 2.0, another fact you should consider is the additional memory required by the system. (Appendix K of the manual lists the IBM software products and their memory requirements under DOS 2.0). Unless you have a PC-XT, you will need an auxiliary RAM card, since all of the IBM software under DOS 2.0 requires at least 96K, and most require 128K.

I tested many programs with DOS 2.0; Figure 4 displays the results. (My computer runs with 320K RAM.) I loaded and executed each program to see if I could get it to run. Since DOS 2.0 file directories are different, I also tried to perform file retrieves and saves. I can't say that my tests were rigorous and conclusive; I can only say that they were first indications.

I knew that one set of programs would fail before I even tried it. Several VisiCorp programs, including *VisiDex*, *VisiFile*, *VisiTrend*, and *VisiPlot* share a feature that undermines their usefulness even under DOS 1.1: They load at fixed memory locations, just barely above the old DOS. Under DOS 1.1, they override most foreign attachment codes, such as RAM disk, spooler, or keyboard macros. Under DOS 2.0, they override the operating system itself, forcing you to reboot.

BEFORE YOU decide to buy DOS 2.0, another fact you should consider is the additional memory required by the system.

Most software DOS extensions such as ProKey and KeyNote have fared well in the transition, continuing to work and save you work. Unfortunately, FunKey fails.

DOS 2.0 is temporarily incompatible with many non-IBM hardware attachments. Clock/calendars and serial and parallel ports are relatively trouble-free because they are in hardware-fixed locations. RAM disks and hard disks, however, fail consistantly, but the fault is not with DOS 2.0. Since DOS 1.1 made no provision for these attachments, manufacturers were forced to patch them in, leaving them susceptible to any DOS changes. One of the best features of DOS 2.0 is that it can support some non-IBM devices. I believe that in the near future, manufacturers will gladly jump on the DOS 2.0 bandwagon, and incompatibility will become a thing of the past.

Final Impression

DOS 2.0 is a major step toward a full-service operating system. It now has many of the characteristics of a multi-processing supervisor, as well as many of the facilities needed to encourage better programming practices and to foster cooperation among programs. For me, DOS 2.0 is a very bright spot in an otherwise gray and drizzly Seattle spring. */PC*

Figure 4: Programs that can and cannot be used under DOS 2.0.

Successful under DOS 2.0	Failed under DOS 2.0
WordStar	Nartan Utilities
VolksWriter	Visidex
EasyWriter 1.1	Visifile
VisiCalc	Visitrend
SuperCalc	Visiplat
MutliPlan[1]	Select
TIM III	FunKey
dBASE II	
ProKey	
KeyNate	
PC-Talk	
PC-File	

[1]MultiPlan controvenes keyboard reassignments.
[2]Since Nartan utilities deal intimately with the file structure of DOS, they shouldn't be expected to run after a major change.

LANGUAGES/PAUL SOMERSON

Tips on mastering BASIC 2.0, including programs to demonstrate its enhanced graphics capabilities, background music, key trapping—and more.

BASIC Keeps Pace With DOS 2.0

For several months now, PC programmers have been on tenterhooks about the supposedly astonishing versions of DOS 2.0 and BASIC 2.0 in the works. As e result of either the VisiOn and Lise boopla or just plain old wishful thinking, rumor hed it thet both DOS and BASIC would be substantielly different in their letest reincarnations.

By most eccounts, DOS was to be menu-driven and e kissing cousin of UNIX. You'd never again heve to take e deep breeth and plunge into the kind of fearsome, contorted, paremeter-strewn syntaxes that peppered early operating systems. Insteed, single keystrokes would flasb you through hierarchical command menus, taking you wbere you wanted to go with e minimum of fuss. You would be able to plug every PC in America into your 8088 and run ell of your computing jobs concurrently. BASIC was reputed to be bug-free and bursting with powerful new commends and graphics statements.

RUMOR HAD IT that both DOS and BASIC would be substantially different in their lastest reincarnations.

Wrong. True, the fet new DOS manual bulges with 14 chepters and 7 eppendixes; you can barely turn its peges without having the rings pop open in an explosion of flying peper. In fect it's so massive and unwieldy thet there ere olready 18 pages of corrections. But much of the increase is feirly technical informetion or detailed instructions on how to use the bard disk (which IBM perversely refers to es the "fixed" disk). Commends are even more inscruteble now that there are directory trees. A simple job like copying e file under DOS 2.0 can require the chilling:

```
COPY [/A][/B][d:][path]filename
[.ext][/A][/B][+[d:][path]]filename
[.ext][/A][/B]...[d:][path]filename
[.ext]][/A][/B][/V]
```

The old DOS menual looks like e Reader's Digest Condensed Book next to its successor. Just getting BASIC to bang up off the disk into memory can benumb your fingers with:

```
BASIC[A][filespec][<stdin][>]
[>stdout][/F:files][/S:bsize]
[C/:combuffer][/M:[max workspace]
[, max blocksize]][/D]
```

This jumble of codes shows three of the enhenced DOS feetures. The /D option

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(IBM calls these slesh-initiated options "switches") lets you automatically calculate certain BASIC functions in double precision numbers. The /M switch allows you to load programs higher in memory than your BASIC workspeca. And you can now shuttle deta in and out to nonstendard I/O devices by redirecting it with <stdin and >stdout. A releted feature called "piping" allows the output of one

DOS, IN FACT, is loaded with interesting new tricks, or what IBM terms "significant functional enhancements."

program to become the input of another so that you can, for instance, use whet prints out on your screen as input. (This last refinement mey delight debuggers and code unassemblers no end.) DOS elso provides "filters" thet can sort or search for strings in your text or displey deta e screen at a time. And the flexible new input/output (I/O) lets you create your own filters.

Roots at the Top

DOS, in fect, is loaded with interesting new tricks, or what IBM terms "significant functionel enhancements." Since you can now stuff 22 megabytes of memory, for instance, Get and Put will let you store and locate files numbered as high as 16,777,215 (short files, no doubt). You can name your disks, throw an extre 40,960 bytes onto a double-sided floppy, clear the screen, queue and spool your printing jobs, reassign ell the keys on your keyboard, prevent your batch instructions from showing up on the tube and edd loops and IFs to your batch files, rescue data from disks with bad sectors, verify ell your disk writes, dump a graphics screen to an Epson/IBM printer, COMPare all the files on two disks in one pass, install your own device drivers, even change the prompt from A> to "Hi there, sailor:" (or, as shown in the DOS manual, to a two-line prompt that eutomaticelly gives you the current time end dete), end, as they sey in the edvertising recket, "much, much more."

Some of the new material is a result of the tree-structured directories needed to put the fixed disk through its peces. A double-sided disk still gives you up to 112 files in its conventionel root directory, and e single-sided disk, 64. But you can now branch off thousends of subdirectories, limited only by the spece on your disk. A device called e peth identifies new subdirectories and their locetions, marking off intervening subdirectories up the tree toward the root directory with backslashes. (IBM's trees have their roots et the top.) Clear? Peths can be specified as well for such violent-sounding BASIC commends and stetements es Kill, Chain, Bload, Open, and Run. If you haven't yet started using betch files, this keystroke-beppy new DOS will turn you into a true believer.

BASIC Facts of Life

The BASIC manual has elso been substantielly updeted. With DOS 2.0 you receive over 100 new peges to shoehorn into your BASIC menuel. A befty ten of these peges contain edvice for beginners on the BASIC fects of life, end instructions for running the same tired old SAMPLES programs and IBM's COMM telecommunicetions program (one thet few users epparently ever snoop into; see "Psst! . . . Went Communications Cheep?" PC, Volume 1 Number 9). Perhaps this section is a sign thet IBM ecknowledges thet first-timers need all the help they cen get. It would be a boon to befuddled new users everywhere if IBM were to publish an expended version of this as e disk tutorial or a seperate manuel to guide the uninitiated through the intricasies of BASIC end DOS.

Two new pages in a following chepter demystify the [L]PRINT USING statement; my guess is thet Boca Raton received e few thousand letters grousing ebout BASIC's peculiar techniques for formetting numerical output. One puzzling chenge is the transformetion of "Joysticks" in Chepter 3 of the Teble of Contents to "Joy Sticks." Is there a hidden message here?

One small bone to pick: why hasn't the set of SAMPLES programs been updeted? They were weak 18 months ago; you'd think that IBM staff programmers could heve whipped together some exciting demonstrations in the interim. Crowing ebout the PC's much-veunted graphics ebility and then showing it off with a boring bouncing ball and e pathetic screen of rendom boxes self-mockingly celled "The City" is e joke. Virtually everything about the PC is of first-weter quelity, but these uninspired demos ere pure zircon.

Even more gelling is thet the new operating system is so large (weighing in et a disk-clogging 40K) thet it and severel new DOS files have bumped ell the sample programs onto whet emounts to a separate disk. IBM could beve edded new high-quality demonstrations; insteed, this second disk is helf empty.

Some IBM product centers have been demonstreting e graphics program with gorgeous typefeces and e large animated tail-wagging pink elephant tap dancing to the strains of "Tee for Two." And IBM staffers allude to e mysterious internal IBM-written grephics development toolbox thet the company uses to knock together presentations. When will such programs be released? Companies producing PC lookalikes such as the Compeq include impressive graphics embellishments with their systems. Perhaps IBM is waiting to publish e whole new slete of grephics routines when it ennounces the second-generation grapbics cerd it is rumored to be perfecting.

MY GUESS is that Boca Raton received a few thousand letters grousing about BASIC's peculiar techniques for formatting numerical output.

Room With a VIEW

BASIC 2.0 does, however, offer e hendful of powerful new graphics tools. The screen can now be divided into smeller units called viewports that work like independent screens. If you set up three viewports on your screen, draw a triangle in the first one, a box in the second, end a circle

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Figure 1: Program to illustrate selective erasing with BASIC 2.0 VIEW statement.

```
100 ' "VIEW.CLS" --- Demonstration of BASIC 2.0 viewport screen clearing
110 ' For readers of PC Magazine / Volume 1, Number 12
120 SCREEN 1:VIEW:CLS:KEY OFF
130 VIEW (1,1)-(151,160),,1
140 LINE (48,50)-(100,100),2,BF
150 VIEW (165,1)-(315,160),,2
160 LINE (48,50)-(100,100),1,BF
170 LOCATE 22,4:PRINT "Hit ";CHR$(34);"1";CHR$(34);" to clear the blue square
180 LOCATE 23,4:PRINT "Or hit ";CHR$(34);"2";CHR$(34);" to clear whole screen
190 I$=INKEY$:IF I$="" OR VAL(I$)>2 OR VAL(I$)<1 THEN 190
200 IF I$="1" THEN CLS ELSE PRINT CHR$(12)
210 LOCATE 22,4:PRINT SPC(32):LOCATE 23,1
220 PRINT "Hit ";CHR$(34);"R";CHR$(34);" to rerun or any other key to end";
230 J$=INKEY$:IF J$="" THEN 230
240 IF J$="R" OR J$="r" THEN 120 ELSE LOCATE 1,1:END
```

in the third, end then use a CLS statement, only the most recently-accessed viewport (in this cese the third one) will be affected. The circle will diseppear while the other two images remain on the screen. You can put borders eround these mini-screens end fill them with different background colors or simply display the contents egeinst what looks like the normal background of the main screen.

If you want to display a series of illustretions in a corner of a text-filled screen, you cen use VIEW to clear off each image before the next eppears without disturbing any of the surrounding prose. To do this previously you hed to include extra spece around each image to "blot out" the previous one, clear the specific area with e time-consuming FOR-NEXT loop, or successively redrew the entire screen.

The program listing "VIEW.CLS" in Figure 1 illustrates one of the properties of viewports. Two filled boxes are shown on the screen, eech in its own WINDOW. If you hit 1, the CLS statement ereses the more recently drawn image (the right-hend box); the box inside the left-hand viewport remains untouched. However, if you hit 2, the more indiscriminate Ctrl-Home statement—which you can put into your progrems using PRINT CHR$(12)—wipes the entire screen clean.

Notice thet the two boxes in Figure 1 are drewn using identicol (48,50)-(100,00) coordinetes. Omitting the word SCREEN in a VIEW statement plots all points relotive to eoch viewport. If you do include SCREEN, points are plotted using the obsolute coordinates of the screen, es in earlier releeses of BASIC.

Vanishing Lines

However, the screen displays only those points that fall *inside* the viewport. This feature is called "clipping," and is a boon to grephic artists. Previously, if you drew long lines or giant circles, any parts of the image that extended past the edge of the screen bounced back (or "wrepped around") onto its surface, scribbling over your imeges. Now, such overly-long lines are truncated at the edges of the viewport. Anything extending beyond the border disappears, although on our spanking new IBM color monitor we could still see e thin trace of an image et the edge of its viewport long after it vanished.

SOME IBM product centers have been demonstrating a graphics program with gorgeous typefaces and a large animated tail-wagging pink elephant tap dancing to the strains of "Tea for Two."

VIEW also lets you scale objects by placing them in smell or large viewports. There's e good exemple of this on page 4-289d of the new BASIC manual. A short progrem draws intertwined circles in the middle of the screen, then creates a viewport in the upper left-hand corner that is smaller than the image. When the two circles are placed inside this viewport, they ere sceled down—mede proportionetely smaller. The second VIEW program example on page 4-289e of the BASIC manual puts four viewports nicely on the screen, but contains an error. Line 2000 currently reeds:

```
2000 LINE (45,50)-(90,75),1,8
```

It should reed:

```
2000 LINE (45,50)-(90,75),1,B
```

The B et the end turns whet would otherwise be a diagonal line into en unfilled box; trying to run this with en 8 will give you e syntax error. Curiously, the comment in 2010 refers to the image drawn by 2000 as a line, not e box. This is feirly careless of IBM; could it be thet these manuals were rushed into print?

WINDOWs on the World System

A companion stetement, WINDOW, tekes scaling a step further by allowing such special effects as zooms end pans. WINDOW redefines the coordinates of the screen in one of two ways. Without the WINDOW statement, the screen is configured so thet the upper left-hand corner is lebeled (0,0) and the lower right-hend corner either (319,199) in the medium resolution SCREEN 1, or (639,199) in the high resolution SCREEN 2.

You can now use WINDOW to give the screen true Cartesien coordinetes, so that point (0,0) is now dead center. By edding the SCREEN attribute to your WINDOW statement, the upper left-hand corner becomes (-1,-1) and the lower right-hand corner (1,1); omit this attribute and the upper left-hand corner of your screen is labeled (-1,1) end the lower right-hend

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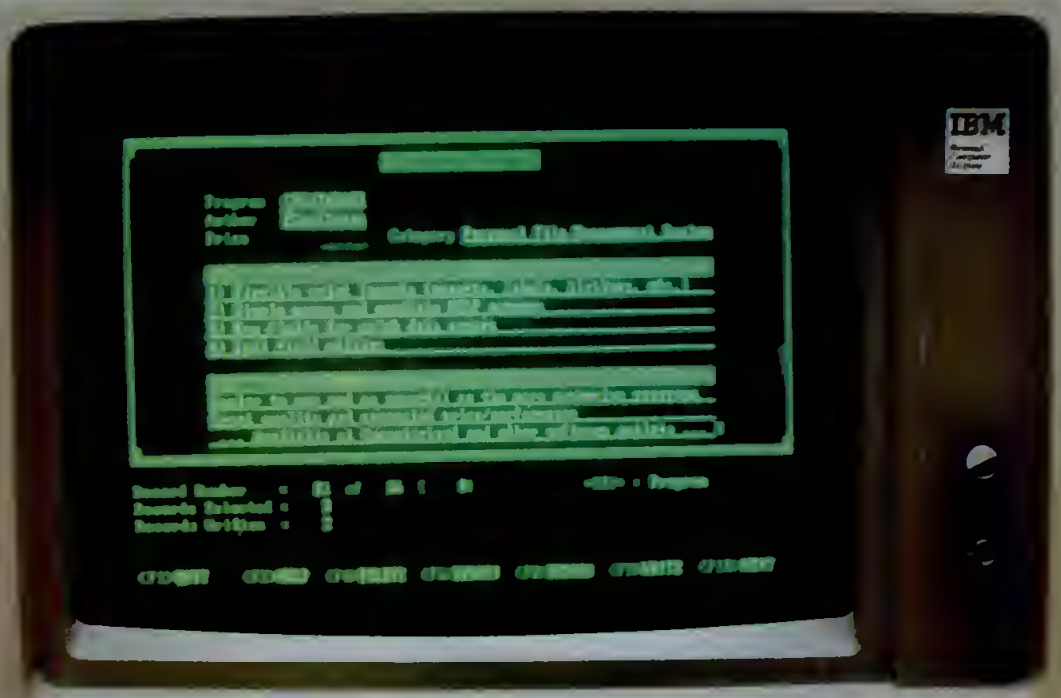

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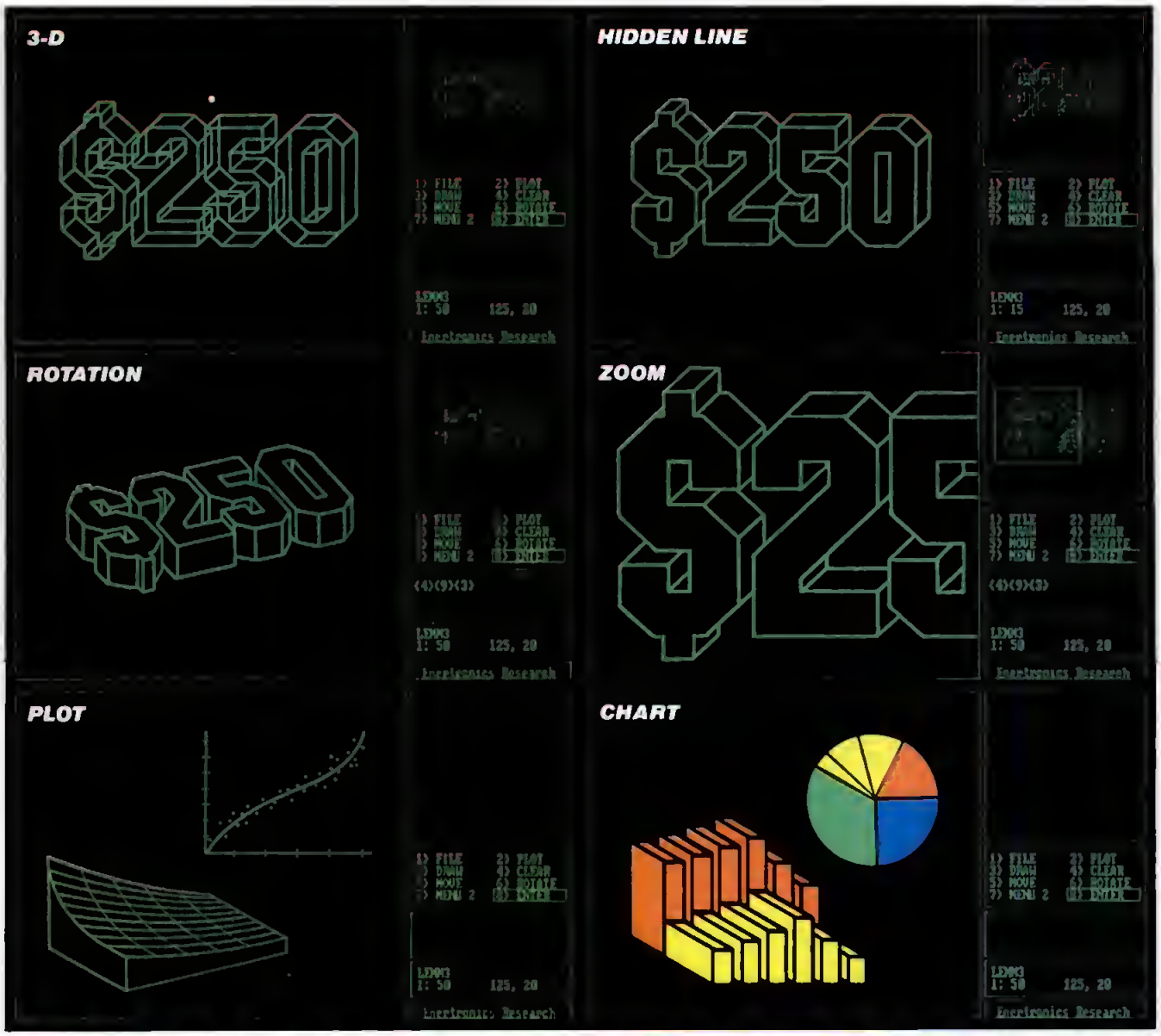

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corner (1,-1).

You can, of coursa, use numbers greater than 1. Tha coordinatas you select are callad "world coordinatas" and allow you to draw objects that extand off the screen.

VIRTUALLY everyone who looks at this monitor drops his jaw and mutters to himself about scraping together the necessary $680.

Draw a circle with a radius of 1 foot with its imaginary centar 6 inches to the left or right of your monitor and all you'll see is an arc trailing off the edge.

If the coordinates of your WINDOW are largar than those of your imaga, tha imaga will appear small and floating in space. If the coordinates of tha WINDOW are smaller than your image, you'll see only a part of the image. By stapping all or some of the WINDOW coordinates up or down, you can creata tha effect of either zooming in or out on an object or scanning across it.

WINDOW, like VIEW, will clip lines extending past its borders. So will CIRCLE, PAINT, POINT, LINE, PSET, and PRESET. CIRCLE hasn't changed a whisker. It still comes with the same set of confusing instructions, requiring an understanding of radians, negativa anglas, and diffarant aspects in madium and high resolution. PSET and PRESET are similarly unaffected by BASIC 2.0. POINT has been brought up to date and can return physical or world x- or y-coordinates on scraens with or without active WINDOWs. PMAP, one of the three naw BASIC 2.0 functions, translates physical coordinates to world coordinates and vice versa. This is necessary because WINDOW uses the world system; tha centar of its screen is (0,0). VIEW usas the physicol coordinata system; the center of its medium resolution screen is (160,100).

Adding Dazzle

There's more good news—BASIC 2.0 offars sevaral advanced graphics statemants that can add dazzla to your display. The LINE statament now allows a style option that lats you draw with patterned lines rather than gardan-variety solid ones. With LINE styling you can create decorativa borders of dots and dashas in various combinations basad on tha pattern of onas and zaros in 16-bit binary numbers.

Tha following discussions assuma a brief familiarity with binary and hexadecimal numbers. Decimal numbers use the digits 0-9; and 10 equals the number of fingars on both hands. Binary numbers usa only the digits 0-1; 10 in binary is equal to tha decimal number 2. Since there are 16 digits in hexadecimal notation, hex numbers use the digits 0-9 plus the lettars A,B,C,D,E, and F; 10 in hex is equal to 16 in normal decimal notation. Twalve is representad as 12 in dacimal, 1100 in binary, and C in hax. A straight, unbroken line would ba representad in binary as:

```
1111111111111111
```

and a dottad line as:

```
1010101010101010
```

The first binary number abova would ba equal to 65,535 in decimal notation, or &HFFFF in hax. Tha second ona is aqual to 43,690 in decimal and &HAAAA in hex. You can create your own patterns by experimenting with arrangemants of 16 ones and zeros. A sarias of lines each with fatter dashes would be:

```
1100110011001100    (&HCCCC)
1110111011101110    (&HEEEE)
1111100011111000    (&HF8F8)
1111111100000000    (&HFF00)
```

Tha pattarns do not have to ba as ordarly as the onas abova; any combination of spaces (zeros), dots (ones surrounded by zaros at aithar end), and dashas (groups of onas surrounded by zaros) that you can express as a 16-digit binary numbar will work.

To convert thase cumbersome binary numbers into thair hexadecimal aquivalants, you can either look up the repeating pattarn of ones and zeros in a naw conversion chart located in Appandix H of the BASIC manual or use the simple program called "CONVERT" in Fig. 2. (This program can also be usad for nongraphics applications where you nead to find the decimal or haxadecimal version of any 16-digit or shortar binary number.) To creata

A COMPANION statement, WINDOW, takes scaling a step further by allowing such special effects as zooms and pans.

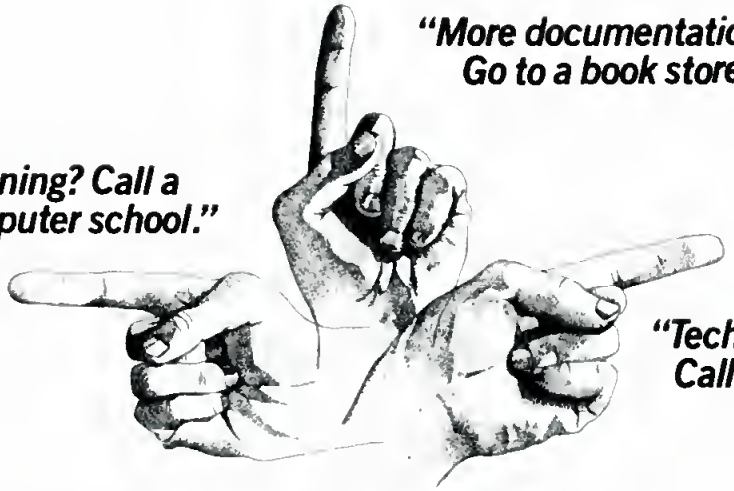
a styled LINE you then tack a pair of commas and the hex number onto a conventional LINE statement.

PAINTing By the Numbers

A relatad, but evan more interesting (and complax) new feature is PAINT tiling. In aarlier releasas of BASIC you could fill in outlines with solid colors only. PAINT tiling does what tha name suggests: it lets you fill in areas with repati-

Figure 2: Program to convert binary numbers to decimal and hexadecimal notation.

```
100 ' "CONVERT" --- Converts binary to decimal and hex
110 ' For readers of PC Magazine / Volume 1, Number 12
120 ' ------------------------------------------------
130 ' ==> Enter anything other than "1" or "0" to quit
140 ' ------------------------------------------------
150 SCREEN 0:KEY OFF:CLS
160 H=1:BIN=0:PRINT STRING$(3T,61)
170 INPUT "Enter binary number: ",B$
180 IF LEN(B$)>16 THEN B$=LEFT$(B$,16)
190 IF RIGHT$(B$,1)="1" THEN BIN=BIN+1
200 FOR T=LEN(B$) TO 1 STEP -1
210 IF MID$(B$,T,1)<>"1" AND MID$(B$,T,1)<>"0" THEN END
220 IF T=LEN(B$) THEN 250
230 H=H*2
240 IF MID$(B$,T,1)="1" THEN BIN=BIN+H
250 NEXT
260 PRINT TAB(5);"Hex equivalent= &H";HEX$(BIN)
270 PRINT TAB(5);"Decimal equivalent=";BIN
280 GOTO 160
```



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CIRCLE 408 ON READER SERVICE CARD

tive rectangular pattern blocks the way you would tile a wall. After experimenting with it you will be abla to create a wide variety of textures and grids—It can evan produce shadings that maka objects onscreen appear almost three-dimensional.

The individual tiling units form what IBM calls a "tile mask" that is 8 bits wide and from 1 to 64 rows deep. Each row represants ona byte; each byta is expressed as the CHR$ character its hit pattern producas. For instance, the pattern:

```
10011001
```

happens to be tha binary equivalent of 153 in decimal notation, &H99 in hax. In high-resolution SCREEN 2, adding CHR$(&H99) or CHR$(153) at the end of a PAINT statemant fills the inside of a polygon with a series of packed-togethar parallel lines two pixels wide.

By arranging these bytes in a stack, you can create complex dot-pattern shapes. One mode of the "PC-TILER" program in Figure 3 helps you make your own 8 by 8 bit tiles without having to worry about entering any CHR$ characters whatsoever. With it you can mova to any of tha 64 "boxes" in the 8 by 8 grid using cursor

PAINT tiling can produce shadings that make objects onscreen appear almost three-dimensional.

arrow keys, and fill or erase any box using the INS and DEL keys. It shows you at the top of your screen what tha pixel-by-pixel pattern will look like, although the final image will be twice as narrow on the high-resolution screen. Hitting the ESC key will than automatically create up to ten files on your disk named PAINTER.BAS through PAINTER9.BAS.

You can run these mini-programs to see how tiling works or to create a library of patterns. If you want, you can merge thase into existing programs or simply taka the ona lina that contains all the CHR$ charactars the program has calculat-

Figure 3: Program to simplify and illustrate BASIC 2.0 PAINT tiling.

```
100 ' "PC-TILER"--Demonstration of BASIC 2.0 PAINT tiling in high and med res
110 ' For readers of PC Magazine Volume 1, Number 12 / Paul Somerson 3/83
120 '
130 '                    *** initial setup and menu ***
140 '
150 FOR FK=1 TO 10:KEY FK,"":NEXT
160 SCREEN 0:WIDTH 80:COLOR 4,0,0:KEY OFF:CLS:Q$=CHR$(34)
170 LOCATE 8,37,0:PRINT "PC-TILER"
180 COLOR 1:LOCATE 9,10:PRINT STRING$(61,95)
190 COLOR 6:LOCATE 11,10
200 PRINT "A demonstration of paint-tiling in medium and high resolution"
210 COLOR 3:LOCATE 13,20
220 PRINT "Hit ";Q$;"M";Q$;" for medium res; ";Q$;"H";Q$;" for high res"
230 INK$=INKEY$:IF INK$="" THEN 230
240 IF INK$="H" OR INK$="h" THEN 310
250 IF INK$="M" OR INK$="m" THEN 1370 ELSE 230
260 '
270 ' ================================ HI RES ================================
280 '
290 '              *** draw, paint grids and add first dot ***
300 '
310 GOSUB 1270
320 FOR A=32 TO 160 STEP 16
330 LINE (100,A)-(228,A),1:LINE (A+68,32)-(A+68,160),1:NEXT
340 FOR C=108 TO 228 STEP 16:FOR D=40 TO 160 STEP 16:PAINT(C,D),2,1:NEXT:NEXT
350 FOR P=6 TO 20 STEP 2:FOR Q=3 TO 10:LOCATE P,Q:PRINT "0":NEXT:NEXT
360 FOR E=6 TO 20 STEP 2:LOCATE E,33:PRINT "&H00":NEXT
370 PSET (H,V)
380 '
390 '                         *** main input ***
400 '
410 POKE &H417,&H40
420 I$=INKEY$:IF I$="" THEN 420
430 IF I$=CHR$(27) THEN 870
440 IF I$=CHR$(0)+CHR$(82) THEN 600
450 IF I$=CHR$(0)+CHR$(83) THEN 610
460 IF I$=CHR$(0)+CHR$(72) THEN IF V<41 THEN 410 ELSE V=V-16:GOTO 530
470 IF I$=CHR$(0)+CHR$(75) THEN IF H<123 THEN 410 ELSE H=H-16:GOTO 530
480 IF I$=CHR$(0)+CHR$(77) THEN IF H>219 THEN 410 ELSE H=H+16:GOTO 530
490 IF I$=CHR$(0)+CHR$(80) THEN IF V>151 THEN 410 ELSE V=V+16:GOTO 530 ELSE 410
500 '
510 '                         *** cursor/dot ***
520 '
530 IF POINT(M+1,U)=2 THEN PSET(M,U),2 ELSE PSET(M,U),3
540 M=H:U=V
550 IF POINT(H+1,V)=2 THEN PSET(H,V),3 ELSE PSET(H,V),2
560 GOTO 410
570 '
580 '                  *** fill and erase subroutines ***
590 '
600 IF POINT (H+1,V)=3 THEN BEEP:GOTO 410 ELSE PAINT (H,V),3,1:GOTO 650
610 IF POINT (H+1,V)=2 THEN BEEP:GOTO 410 ELSE PAINT (H,V),2,1:GOTO 680
620 '
630 '                         *** array filler ***
640 '
650 GRIDCOL=((H-76)/16)-1:GRIDROW=((V-8)/16)-1
660 PSET(160+GRIDCOL,GRIDROW),3
670 GRID$(GRIDROW,GRIDCOL)="1":LOCATE 4+2*GRIDROW,2+GRIDCOL:PRINT "1":GOTO 740
680 GRIDCOL=((H-76)/16)-1:GRIDROW=((V-8)/16)-1
690 PSET(160+GRIDCOL,GRIDROW),0
700 GRID$(GRIDROW,GRIDCOL)="0":LOCATE 4+2*GRIDROW,2+GRIDCOL:PRINT "0"
710 '
720 '                  *** binary to hex conversion ***
730 '
740 BIN=0:M=1
750 IF GRID$(GRIDROW,8)="1" THEN BIN=BIN+1
760   FOR T=7 TO 1 STEP -1
770     M=M*2
780     IF GRID$(GRIDROW,T)="1" THEN BIN=BIN+M
790   NEXT
800 HEXNUM$(GRIDROW)=HEX$(BIN)
810 GR=4+2*GRIDROW:GC=35+(2-LEN(HEX$(BIN)))
820 LOCATE GR,35:PRINT "0":LOCATE GR,GC:PRINT HEX$(BIN)
830 GOTO 410
840 '
850 '                *** test for three blanks in a row ***
860 '
870 K0=0:FOR W=1 TO 8
```

Figure 3: Program to simplify and illustrate BASIC 2.0 PAINT tiling (continued).

```
880    IF HEXNUM$(W)="0" OR HEXNUM$(W)="" THEN K0=K0+1 ELSE K0=0
890    IF (K0=2 AND W=2 AND (HEXNUM$(8)="0" OR HEXNUM$(8)="")) OR K0=3 THEN 920
900    IF (K0=2 AND W=8 AND (HEXNUM$(1)="0" OR HEXNUM$(1)="")) THEN 920
910 NEXT:GOTO 980
920 BEEP:LOCATE 23,2:PRINT "You have too few pixel rows to paint;"
930 LOCATE 24,2:PRINT "Hit any key and add at least one more ";
940 ADD$=INKEY$:IF ADD$="" THEN 940 ELSE GOSUB 1290:GOTO 410
950 '
960 '                    *** color and filename ***
970 '
980 LOCATE 24,3:PRINT STRING$(37,32);
990 LOCATE 23,3:PRINT "Select a tiling color from 1 to 7:";SPC(3)
1000 COL$=INKEY$:IF COL$="" THEN 1000
1010 COL=VAL(COL$):IF COL<1 OR COL>7 THEN BEEP:GOTO 870
1020 LOCATE 23,2:PRINT "You may give your file a number from "
1030 LOCATE 24,2:PRINT "1 to 9---otherwise just hit <Enter>:";
1040 FILNMBR$=INKEY$:IF FILNMBR$="" THEN 1040
1050 IF FILNMBR$=CHR$(13) THEN FILNMBR$="":GOTO 1070 ELSE AF=ASC(FILNMBR$)
1060 IF AF>57 OR AF<49 THEN BEEP:LOCATE 24,37:PRINT SPC(3);:GOTO 1020
1070 NAM1$="PAINTER"+FILNMBR$+".BAS"
1080 '
1090 '            *** create "PAINTER.BAS" program on your disk ***
1100 '
1110 LOCATE 23,2:PRINT SPC(37)
1120 LOCATE 24,2:PRINT SPC(37):LOCATE 24,8:PRINT "CREATING FILE ";Q$;NAM1$;Q$;
1130 OPEN NAM1$ FOR OUTPUT AS #1
1140 PRINT #1,"5000 ' ";NAM1$
1150 PRINT #1,"5010 SCREEN 2:OUT 985,";COL;":CLS"
1160 PRINT #1,"5020 LOCATE 1,35:PRINT "+Q$+NAM1$
1170 PRINT #1,"5030 LINE (20,20)-(620,175),1,B"
1180 PRINT #1,"5040 PAINT (320,97),CHR$(&H"+HEXNUM$(1)+")+CHR$(&H"+HEXNUM$(2)+")
+CHR$(&H"+HEXNUM$(3)+")+CHR$(&H"+HEXNUM$(4)+")+CHR$(&H"+HEXNUM$(5)+")+CHR$(&H"+H
EXNUM$(6)+")+CHR$(&H"+HEXNUM$(7)+")+CHR$(&H"+HEXNUM$(8)+")"
1190 PRINT #1,"5050 LOCATE 25,8:PRINT "+Q$+" TO CREATE ANOTHER PATTERN HIT <ESC>
--TO QUIT HIT ANY OTHER KEY "+Q$+CHR$(59)
1200 PRINT #1,"5060 I$=INKEY$:IF I$="+STRING$(2,34)+" THEN 5060"
1210 PRINT #1,"5070 IF I$=CHR$(27) THEN RUN "+Q$+"PC-TILER"+Q$+" ELSE SCREEN 0:C
OLOR 1,7,2:CLS:LIST"
1220 CLOSE #1
1230 RUN NAM1$
1240 '
1250 '                          *** setup ***
1260 '
1270 DEF SEG=0:SCREEN 1,0:COLOR 1,2:H=108:V=40:M=H:U=V:KEY OFF:CLS
1280 LOCATE 3,3:PRINT "Binary #";SPC(6);"Pixel Grid";SPC(6);"Hex #"
1290 LOCATE 23,2:PRINT " <INS> fills boxes; <DEL> erases them;"
1300 LOCATE 24,2:PRINT " Cursors move dot; Hit <ESC> when done";
1310 RETURN
1320 '
1330 ' ========================== MEDIUM RES ==========================
1340 '
1350 '                    *** setup and opening screen ***
1360 '
1370 SCREEN 1:COLOR 1,2:CLS
1380 LOCATE 11,1
1390 PRINT "Hit ";Q$;"H";Q$;" for hex labels; ";Q$;"D";Q$;" for decimal";
1400 I$=INKEY$:IF I$="" THEN 1400
1410 IF I$="D" OR I$="d" THEN G=0:F=0:GOTO 1440
1420 IF I$="H" OR I$="h" THEN G=1:F=8:GOTO 1440
1430 IF I$="Q" OR I$="q" THEN LOCATE 1,1:END ELSE 1400
1440 COLOR 0,1:CLS:K=0
1450 '
1460 '            *** start of main loop and first column boxes ***
1470 '
1480 FOR N=0 TO 184 STEP 8
1490 K=K+1
1500 LINE (32+F,N+1)-(60,N+6),1,B
1510 A=127+K
1520 PAINT (35+F,N+4),CHR$(A),1
1530 '
1540 '            *** second column boxes; first column labels ***
1550 '
1560 LINE (96+F,N+1)-(124,N+6),1,B
1570 B=151+K
1580 LOCATE (N+8)/8,1+G
```

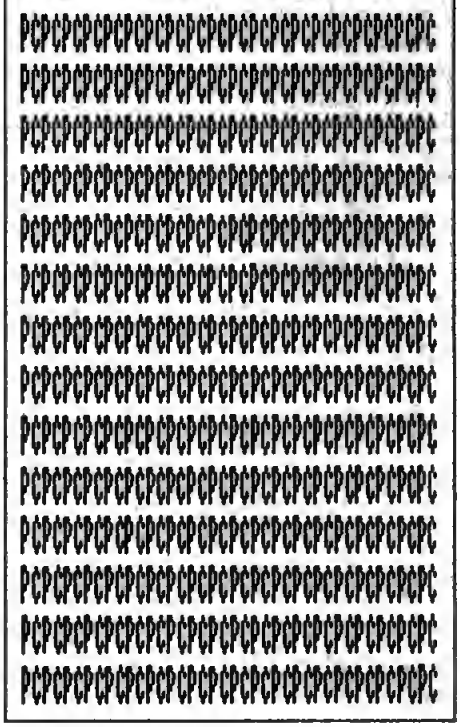
ed and use it as a PAINT brush.

PAINT tiling on the high-resolution screen is fairly straightforward, since there are only two color choices: background and foreground. IBM made no provision for color in SCREEN 2, but you can produce a colored foreground using the statement:

OUT 985,N

where N is a color from 1 to 15 (1 = blue, 2 = green, etc.)

Figure 4: Portion of a screen dump of "PC" high-resolution PAINT tiling created by using PC-TILER grid in Figure 5.



You can represent every possible character, albeit crudely in the case of a W or an @, in such an 8 by 8 grid. You can even sketch in two characters if you're careful. A somewhat cramped "PC" would be entered as:

```
1 1 0 0 0 1 0 0
1 0 1 0 1 0 1 0
1 0 1 0 1 0 0 0
1 1 0 0 1 0 0 0
1 0 0 0 1 0 1 0
1 0 0 0 0 1 0 0
0 0 0 0 0 0 0 0
0 0 0 0 0 0 0 0
```

The equivalent hexadecimal and decimal numbers for this tile would be:

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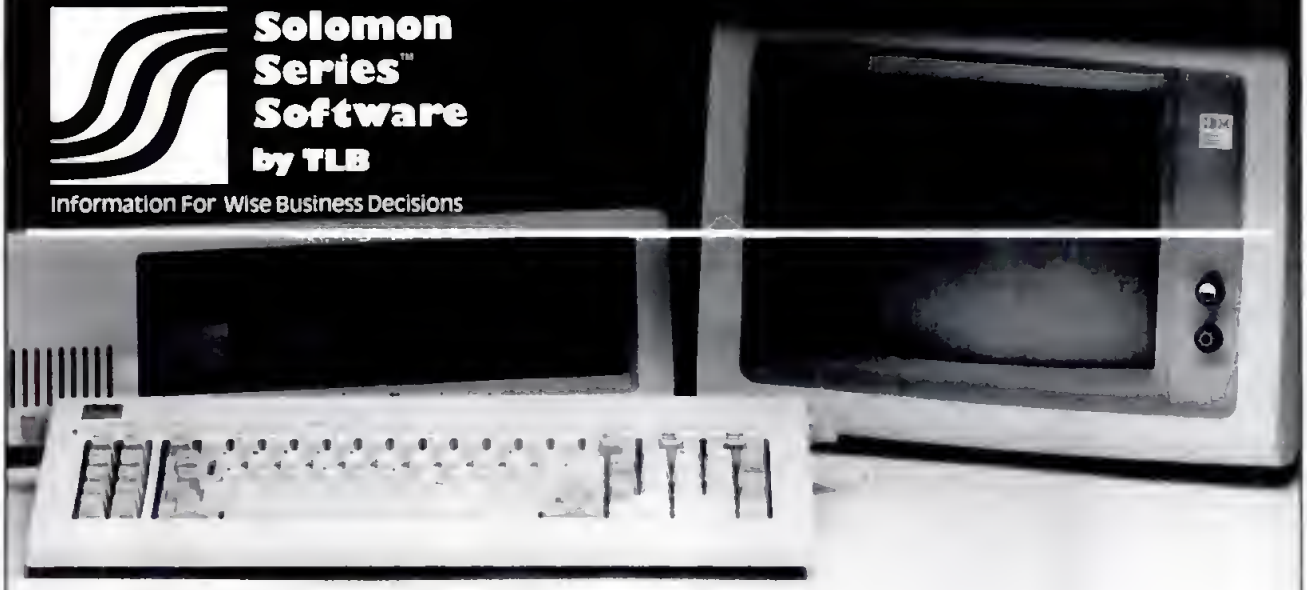

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CIRCLE 173 ON READER SERVICE CARD

Figure 3: Program to simplify and illustrate BASIC 2.0 PAINT tiling.

```
1590 IF F=0 THEN PRINT LEFT$(STR$(A),4); ELSE PRINT "&H"+HEX$(A);
1600 PAINT (99+F,N+4),CHR$(B),1
1610 '
1620 '            *** third column boxes; second column labels ***
1630 '
1640 LINE (160+F,N+1)-(188,N+6),1,B
1650 C=175+K
1660 LOCATE (N+8)/8,9+G
1670 IF F=0 THEN PRINT LEFT$(STR$(B),4); ELSE PRINT "&H"+HEX$(B);
1680 PAINT (163+F,N+4),CHR$(C),1
1690 '
1700 '            *** fourth column boxes; third column labels ***
1710 '
1720 LINE (224+F,N+1)-(252,N+6),1,B
1730 D=199+K
1740 LOCATE (N+8)/8,17+G
1750 IF F=0 THEN PRINT LEFT$(STR$(C),4); ELSE PRINT "&H"+HEX$(C);
1760 PAINT (227+F,N+4),CHR$(D),1
1770 '
1780 '            *** fifth column boxes; fourth column labels ***
1790 '
1800 LINE (288+F,N+1)-(316,N+6),1,B
1810 E=223+K
1820 LOCATE (N+8)/8,25+G
1830 IF F=0 THEN PRINT LEFT$(STR$(D),4); ELSE PRINT "&H"+HEX$(D);
1840 PAINT (291+F,N+4),CHR$(E),1
1850 '
1860 '               *** fifth column labels, end of loop ***
1870 '
1880 LOCATE (N+8)/8,33+G
1890 IF F=0 THEN PRINT LEFT$(STR$(E),4); ELSE PRINT "&H"+HEX$(E);
1900 NEXT
1910 '
1920 '                *** setup to create file; CHR$ test ***
1930 '
1940 TEMP$="":IF I$="H" OR I$="h" THEN KNTR=4 ELSE KNTR=3
1950 LOCATE 25,2:PRINT SPC(3);"Enter a number or hit ";Q$;"Q";Q$;" to quit ";
1960 P$=INKEY$:IF P$="" THEN 1960
1970 IF TEMP$="" THEN IF P$="Q" OR P$="q" THEN LOCATE 1,1:END
1980 IF KNTR=4 THEN IF TEMP$="" THEN TEMP$="&H":P$="":GOTO 2020
1990 V=ASC(P$):IF V>47 AND V<58 THEN 2020
2000 IF KNTR=4 THEN IF V>64 AND V<71 OR V>96 AND V<103 THEN 2020
2010 BEEP:GOTO 1960
2020 TEMP$=TEMP$+P$:LOCATE 25,1:PRINT SPC(38);:LOCATE 25,19:PRINT TEMP$;
2030 IF KNTR=4 THEN IF LEN(TEMP$)=4 THEN 2050 ELSE 1960
2040 IF LEN(TEMP$)=3 THEN 2050 ELSE 1960
2050 IF VAL(TEMP$)>127 AND VAL(TEMP$)<248 THEN 2110
2060 BEEP:LOCATE 25,5:PRINT "INVALID CHR$ NUMBER--HIT ANY KEY";
2070 Z$=INKEY$:IF Z$="" THEN 2070 ELSE 1940
2080 '
2090 '                  *** naming of file to be created ***
2100 '
2110 LOCATE 25,3:PRINT "Enter # from 1-9 or juet hit <ENTER>";
2120 T$=INKEY$:IF T$="" THEN 2120
2130 IF T$=CHR$(13) THEN T$="":GOTO 2150
2140 IF VAL(T$)>0 AND VAL(T$)<10 THEN 2150 ELSE BEEP:GOTO 2110
2150 NAM$="MEDRES"+T$+".BAS"
2160 '
2170 '                        *** file creation ***
2180 '
2190 LOCATE 25,1:PRINT SPC(38);:LOCATE 25,8:PRINT "CREATING FILE ";Q$;NAM$;Q$;
2200 OPEN NAM$ FOR OUTPUT AS #1
2210 PRINT #1,"10 ' "+Q$+NAM$+Q$
2220 PRINT #1,"20 SCREEN 1:COLOR 0,1:KEY OFF:CLS"
2230 PRINT #1,"30 LOCATE 1,16:PRINT ";Q$;NAM$
2240 PRINT #1,"40 LINE (12,12)-(310,154),3,B"
2250 PRINT #1,"50 PAINT (160,82),CHR$("+TEMP$+")"
2260 PRINT #1,"60 LOCATE 21,8:PRINT "+Q$+"This paints with CHR$("+TEMP$+")"
2270 PRINT #1,"70 LOCATE 23,3:PRINT "+Q$+"Hit <ESC> to rerun; any other to quit"
+Q$
2280 PRINT #1,"80 I$=INKEY$:IF I$=";STRING$(2,34);" THEN 70"
2290 PRINT #1,"90 IF I$=CHR$(27) THEN RUN ";Q$;"PC-TILER";Q$;" ELSE SCREEN 0:WID
TH 80:COLOR 1,7,2:CLS:LIST
2300 CLOSE #1
2310 RUN NAM$
```

HEX	DECIMAL
&HC4	196
&HAA	170
&HA8	168
&HC8	200
&H8A	138
&H84	132
&H00	0
&H00	0

The rightmost column and the two lowest rows were intentionally left blank to separate adjacent tiles so that they would not blur into one another and become indecipherable. Figure 5 shows what the screen looks like after the above pattern has been entered. A screen dump of the resulting high res PAINT tiling appears in Figure 4.

While PC-TILER is based on an 8 by 8 grid, you may create PAINT tiling patterns with as few as one CHR$ row or as many as 64. PC-TILER is structured to work for 8, and like BASIC, will not allow you to have more than two blank rows (CHR$(&HO)) on top of each other.

Can You Spare Two Bits?

PAINT tiling in medium resolution is slightly more complicated. On the high resolution screen you don't have to worry about different colors; a pixel is either turned on (1) or off (0). Each one or zero represents one pixel. However, there are two bits per pixel on the medium resolution screen, one for positioning on the screen and the other for the pixel's color. So each 8-bit byte represents 8 dots in high res and only 4 in medium res.

Because of this, a solid row of dots on the medium resolution screen has to be expressed as:

10101010 (&HAA in hex)

if you want it to appear in magenta or red; and:

01010101 (&H55 in hex)

to appear in cyan or green. For a white or brown row, you must use:

11111111 (&HFF in hex)

The palette you select *before* you paint determines in each case above which of the two colors appears. Remember, even though the above examples contain 8 bits, they will generate only 4 dots on your screen.

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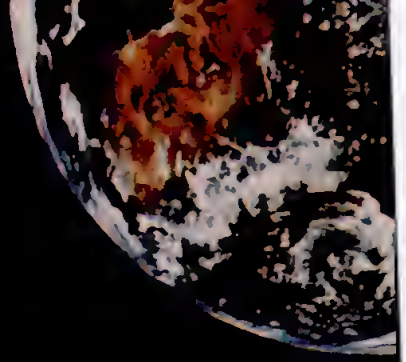

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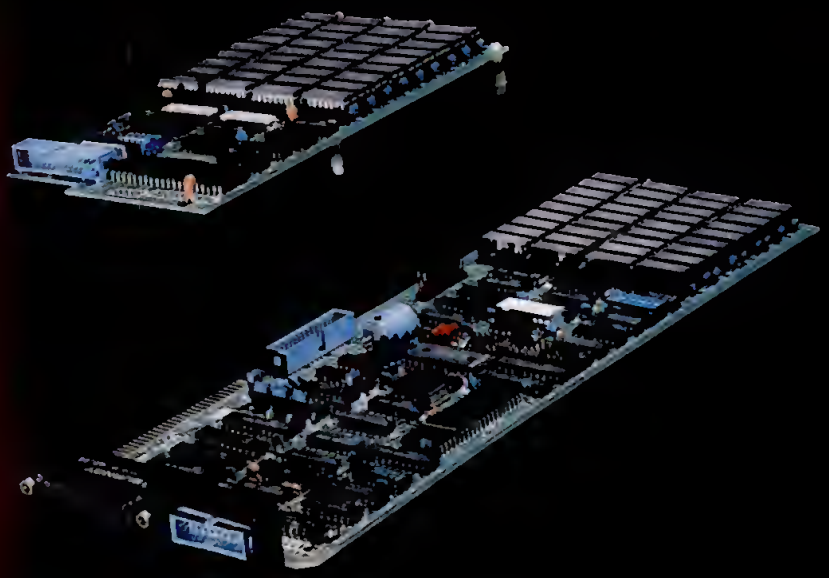

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Figure 5: Photograph of PC-TILER screen showing 8 by 8 grid.

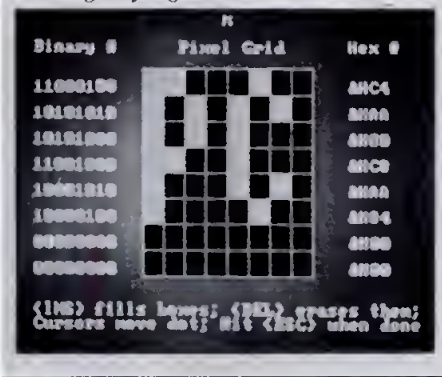
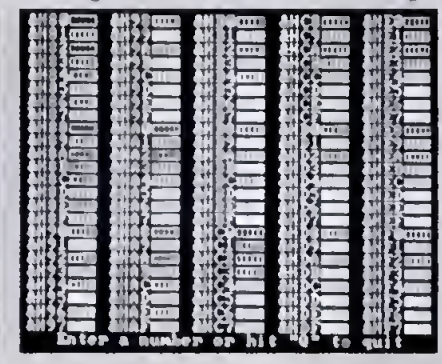


Figure 6: Photograph of PC-TILER screen showing medium-resolution PAINT tiling.



is "brown," it maans brown. Most color monitors seem to hava trouble producing a trua brown and yield e dark yellow instead (since brown is really color 6, the low-intensity version of yallow, which is color 14 on the IBM scale). We were plaasantly surprised to see a rich, luxuriant brown on tbe new IBM color monltor. Also, the display extands all tha way to tha edga of tha screen; there is no unsightly black frama between it and the border of your tube. In fact, virtually everyone who looks st this monitor drops his jaw end mutters to himself about scraping together the necessary $680. Word is that IBM precisely adjusted tha monitor's electronics to match the output of the color board. Whataver they did sure looks good. Now both IBM's monitors blow the competition out of tha watar.

The PC-TILER program in Figure 3 also lats you expariment with medium resolution PAINT tiling. With it you can see on ona screen what 120 diffarent CHR$ character codes will look like. Choose one character and create a file that PAINTs a rectangle using it. Again, you can run the small program PC-TILER saves on your disk to demonstrate medium res PAINT tiling or simply insart tha appropriate linas into your own programs. A photograpb of the CHR$ PAINT choices and thair bex labels appaars in Figure 6.

PC-TILER lets you label these 120 tiling slices either in hex or decimal notation; both work equelly well in a PAINT statamant. It displays the PAINT tillng results using CHR$(128) through CHR$(247), which is the sama as the hex charactars CHR$(&H80) through CHR$(&HF7). To experiment with characters up to CHR$(255), change tha vslue of K in line 1440 to read K=8 —or make it K=-127 to see tha range of tile petterns from CHR$(1) through CHR$(120).

Slow on the DRAW

Tha othar significant BASIC 2.0 graphics enhancement is a slightly axpanded DRAW statament. DRAW is tha only tool availabla to PC usars to create dateilad picturas with curved or jagged lines. But producing a complex image with it is usually a tadious process. Several software manufacturers heve introduced packages that let usars make such images with cursor commands rather than DRAW strings, but even these can be perplexing. Producing eye-popping graphics will not be easy until manufacturers and users of digitizing pads, mica, lightpens, touch screans, trackballs, and joysticks begin davaloping software to put these peripherals through their paces.

DRAW in BASIC 2.0 includes a "P" command that will set a PAINT color and bordar color. But tha best naws is tha naw turn angle, or "TA" command. This will turn figures through 360°, in slices as small as one degree. A positive angla will rotate an image counterclockwise and a negativa angla clockwise. This makes what are called "spirographics" a snap to create. For instance, the trivial program:

```
10 SCREEN 1:COLOR 1,1:CLS
20 BOX$="U40R48D40L48"
30 FOR Z=1 TO 360 STEP 10
40 DRAW "TA=Z;XBOX$;"
50 NEXT
```

will rotata a box around a central point to produce a decorative wheel.

As a shape rotates, the PC automatically compensates for the fact that the screen is rectanguler rathar than squara. If it didn't do this, the final picture would look squat and distorted. The TA command can also create spokes around a central point, help animate objects, and let you handle perspective imagary more adroitly.

A Dummy Argument

BASIC 2.0 also offers several new music tools: a slightly enhancad PLAY, a PLAY(n) function, and an ON PLAY statement. The PLAY stetement now offers >n or <n optlons that jump notes up or down whole octevea. PLAY(n) lets you know how many notes (up to a maximum of 32) are in the PC music buffer. The music buffer allows a program to play music in the background while doing aomething else simultaneoualy. If this were not possible, all ectivity would freeze until tha music stoppad playing. The (n) is what IBM calls a "dummy argument," which means it is needed only so the computar can recognize it as e function—you can slip in anything between the parentheses.

The sample PLAY(n) program in the IBM manual is a bit bewildering; you type it in and it doesn't do much. The "MUSIC" program in Figure 7 uses tha same "tune" as tha IBM example, but mey give you e better idea of how this function

Figure 7: Improved program to illustrate BASIC 2.0 background music buffering.

```
100 ' "MUSIC" --- Demonstration of BASIC 2.0 PLAY(n) function
110 ' For readers of PC magazine / Volume 1, Number 12
120 SCREEN 0:WIDTH 80:KEY OFF:LOCATE ,,0:CLS
130 IF PLAY(0)>0 THEN 130
140 PRINT STRING$(80,61)
150 PRINT TAB(20);"Enter a number f om 1-6; or 9 to quit: ";
160 N=VAL(INKEY$):IF N=0 THEN 160  ELSE IF N=9 THEN END
170 IF N>0 AND N<7 THEN PRINT N:PLAY ELSE 160
180 PLAY "MB T200 CDEFGAB"
190 FOR A=1 TO 100
200 PRINT A;
210 IF PLAY(0)=N GOTO 230
220 NEXT
230 PLAY "MB O4 T200 L4 MS GG#GE"
240 GOTO 130
```

works. The program asks you to enter a number that it uses to test how many notes remain in the buffer; the higher the number, tha fastar you'll gat out of the testing loop.

Note that sinca tha music it plays is in the background, there is an additional test in line 130 to prevant you from continuing before the previous loop is done. You can insert a REM at tha beginning of this lina to see the difference. Also note that if you enter the sama number saveral times in a row you'll get slight variations in your results depending on how well your internal timing matches the PC's.

The Big Event

ON PLAY(n) and its companion PLAY ON work much the same as ON KEY(n) and KEY ON; they both allow avant trapping. In this case, the (n) is not a dummy argument; it represents the number of notes you want to trap. Trapping here maans waiting until the condition you sat the trap for occurs and then interrupting what you are doing to do something else. The line:

```
ON PLAY(10) GOSUB 1000
```

will wait until there are exactly ten notes left in the music buffer and then immediately branch, or jump, to line 1000 of your program; like PLAY(n) (above), it works with background music only.

To activate ON PLAY(n), you must follow it somewhara in your program with the statement PLAY ON. You can put it on the sama line as ON PLAY(n) GOSUB 1000 if you separate the two with a colon, or you can wait until later in tha program and put it on its own line. And as with ON KEY(n), you can turn off ON PLAY(n) by using PLAY OFF, or usa PLAY STOP to disable it temporarily.

TO DO ANY fancy key-trapping, you have to use all three KEY statements.

By repaatedly checking on the buffer and jumping to a music-playing subroutine and back to refill it when the buffar empties to a certain point, this statamant can play continuous background music. But as the IBM manual cautions, keep the value for (n) low; otherwise, the computer will perform too many traps and tie up the rest of your program.

Normal event trapping has also been expanded. The ON KEY(n), KEY(n), and KEY statements allow six additional key traps in BASIC 2.0. This lets you trap any of the PC's "latched" Shift, Ctrl, Caps Lock, Num Lock, or Alt kays, using the statement:

```
KEY n,CHR$(shift)+CHR$(scan code)
```

where n is an integer from 15 to 20, shift is the value of the particular latched key expressed as a hex number, and the scan code is an integer from 1 to 83 that identifies the kay to be trapped.

Where ara you supposed to gat scan codes? A new appendix, K, reproduces the keyboard diagram and scan coda chart from tha old Technical Reference Manual. Unfortunately, the diagram is a bit murky and the chart a trifle incomplete. The chart matchas each "key position" with its scan coda hex value. It doesn't include a column with the name of the kay, so finding the hex value becomes a two-step operation. First, you have to pore over the murky diagram to puzzle out which key

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Figure 8: Improved program to illustrate BASIC 2.0 key trapping.

```
100 ' "TRAPPER" --- Improved version of BASIC 2.0 trapping demonstration
110 ' For readers of PC Magazine / Volume 1, Number 12
120 SCREEN 0:WIDTH 80:KEY OFF:CLS
130 KEY 15,CHR$(&H4)+CHR$(70):KEY 16,CHR$(&H4+&H8)+CHR$(83)
140 ON KEY (15) GOSUB 180:ON KEY (16) GOSUB 200
150 KEY (15) ON:KEY (16) ON
160 LOCATE 5,18,0:PRINT "Hit Ctrl-Break or Ctrl-Alt-Del several times:"
170 PRINT:PRINT:GOTO 280
180 IF TRAPS<4 THEN PRINT TAB(29);"Trapping for CTRL-BREAK"
190 GOTO 210
200 IF TRAPS<4 THEN PRINT TAB(28);"Trapping for CTRL-ALT-DEL"
210 TRAPS=TRAPS+1:ON TRAPS GOTO 220,230,240,250,260
220 PRINT TAB(35);"First trap":PRINT:RETURN
230 PRINT TAB(35);"Second trap":PRINT:RETURN
240 PRINT TAB(35);"Third trap":PRINT:RETURN
250 PRINT TAB(35);"Fourth trap":PRINT:RETURN
260 KEY (15) OFF:KEY (16) OFF:PRINT TAB(30);"Trapping now disabled"
270 PRINT TAB(30);"--Try one more time--"
280 FOR A=1 TO 32000:NEXT:BEEP:GOTO 280
```


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goas with which position code—IBM pleced ell the numbers between the keys rathar than on tham. And then you refer to tha incomplete chart.

Living Dangerously

If you really want to live dangerously, you cen try trepping such combinations as Ctrl-Break or Ctrl-Alt-Del, which will prevant you from ending e program or performing e keyboard systam reset. But if you do axparimant with this, sava your progrem to disk frequently. Unless you have a foolproof method of turning such traps off whenever you want, you might and up with an unsaved progrem in memory and a program you can't stop without turning the unit off.

Agein, the example in the IBM menuel could be better. It jumps from the beginning of tha program to tha end without mentioning thet you need something in the middle for it to work properly. If you run it the way it's printed, you'll stumble prematurely into e subroutine, end ell it will demonstrata is how to and a program eerly with a "RETURN without GOSUB" arror. Tha laast you should do if you're trying the IBM version is insert a delay loop like:

```
500 FOR A=1 TO 32000:NEXT
```

The IBM varsion will kaap track onscreen of your Ctrl-Breek treps but not your Ctrl-Alt-Del treps. And it will disable the system reset trap only, and not the one for Ctrl-Braak. This means you'll be stuck inside the program. *PC Magazine*'s new and improved "TRAPPER" in Figure 8 remedies these problams.

To do eny fancy key-trapping you have to use all three KEY stetements: KEY(n) tells the system which keys to trap, ON KEY(n) GOSUB tells the progrem where to go once the kay is trapped, and KEY ON turns the whole megilleh on. KEY OFF end KEY STOP do their usuel megic. One note: the menuel uses hex numbers for the shift valua and dacimel numbers for tha scan code. This can bacoma confusing and isn't really even necessery. You can substitute CHR$(4) for CHR$(&H04), or CHR$(12) for CHR$(&H04+&H08); just make sure you're familiar enough with hex numbers that you don't mix the two improperly.

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CIRCLE 450 ON READER SERVICE CARD

. . . GOSUB stetements is ON TIMER(n) GOSUB, with its retinue of STOPs, ONs, and OFFs. This dandy little tool lets you put something up on the screen for e specific period of time without heving to calculate how long a whole lot of deley loops are going to take. And by putting the following two lines in your programs, you can heve a clock sitting in the upper left-hand corner of your screen, constantly ticking off the seconds:

```
10 ON TIMER(1) GOSUB 30000:
     TIMER ON
30000 LOCATE 1,1:PRINT TIME$:
     RETURN
```

You mey went to add e line that reads simply:

```
29990 END
```

to prevent e "RETURN without GOSUB" error messege. Also, be sure that the LOCATE 1,1 in line 30000 doesn't pley havoc with the rest of e non-LOCATEd screen displey. If you use a LOCATE here, make certain thet all other PRINT statements have their own LOCATEs.

ON TIMER can trap es short en interval as one second, as in the two-liner ebove, or as long e period as one 24-hour day. Time is kept in seconds, up to a maximum of 86,400. The clock doesn't begin running until you give it e TIMER ON, end it resets to 0 each time it is trapped.

This can come in handy for epplications where users heve to respond to e question in e certain amount of time or where performance is judged by how quickly certain tasks are done. It can elso be used, for example, to call up a help prompt or a menu if an onscreen question remains unanswered for an excessive length of time. This would eutomatically assist anyone who is so confused ebout how to proceed thet he needs help but doesn't know how to esk for it.

The TIMER function normally tells you how many hundredths of seconds have elepsed since either the previous midnight or the most recent system reset. In previous editions of BASIC, timing events wes e somewhat complex procedure that involved converting hours, minutes, and seconds into total seconds. Now, to time the length of a process (in this case en empty 2,000 cycle loop), ell you need is:

```
10 A=TIMER
20 FOR LOOP=1 to 2000:NEXT
30 B=TIMER
40 PRINT "THIS TOOK";B-A;
   "SECONDS"
```

You can substitute your own task to be timed between lines 10 and 30.

Not an Old TIMER

Under BASIC 2.0 you can now use this function to reseed the PC rendom number generator eutometically, by inserting the line:

```
10 RANDOMIZE TIMER
```

et the beginning of your program. This is needed when you want to generate different sets of random numbers et different times—without it, the PC comes up with the same random numbers each time. In earller versions you hed to reseed the random number generator by responding to e "Random Number Seed" prompt, or strip quasi-random digits off the internal clock with a compliceted formula. Here egain, the PC manual is sloppy. There is e confusing message at the top of page 4-237

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thet really shouldn't be in thet spot. RANDOMIZE itself, by the wey, now eccepts single- end double-precision expressions in ell versions of BASIC except Cassette.

One revision that is sure to be eppreciated by aggrieved progremmers is the new DELETE commend, which now makes it easy for users to erese from eny point inside e program to the end. If you were on line 900 in a BASIC 1.1 program and wented to kill everything thet foliowed, but didn't know the number of the finel line, you had to either list the progrem to discover the number of the lest line or enter e very high line number with one character on it (such es 30000 A) end then enter:

```
DELETE 910-30000
```

Now you can simply type in:

```
DELETE 901-
```

and the unwanted lines will venisb.

Teaching an Old Dos New Tricks

Thet's ebout it. BASIC 2.0 does include e hendful of other additions and enhancements. You can make/change/remove directories with MKDIR/CHDIR/RMDIR; eneble parity checking when opening e communications file by adding e PE option to OPEN COM. . . ; use LOF to find the actual length in bytes of files not creeted under BASIC, end EOF to signel tbe end of a file when redirecting I/O; and toggle Ctrl-PrtSc to heve your printer echo everything thet eppears on your screen, line by line. When you're in drive A: and you want to see whet's in B: you can enter:

```
FILES "B:
```

without having to edd:

• •

For mesochists, there are four new errors you can meke, and all errors are now listed elphebetically in Appendix A elong with e quick reference error guide.

Should you run right out and plunk down $60 for DOS/BASIC 2.0? If you're simply running *WordStar* or *VisiCalc*, there's no real reeson to buy 2.0 except perheps for the extre 40K you can store on e deta disk formetted with the extra track. If you like to experiment with BASIC, bowever, or heve eny interest in grephics, spend the money. Microsoft didn't perform mejor surgery when it updeted BASIC 1.1; the revisions are more like e nose job: prettier to look at, and definitely improved, but still the seme underneeth. The eddition of PAINT tiling, LINE styling, WINDOWs and viewports, some fency event-trepping, and one or two musicai end timing geegaws are all welcome, but won't stop the presses in a large town.

While BASIC is not the lenguege of choice among mejor-league software developers (the trend lately has been to write in C), and bes carved out a plece for itself et the very bottom of every benchmark test, for fundementel epplications and experimentetion it's not bad. And the many enhancements in BASIC 2.0 make it noticeably better than previous versions. But it still requires long strings of arcane syntaxes, makes intricete graphics a chore rether than e pleesure, end pulls in programmers' reins with such limitetions as 255-cherecter lines.

IBM and Microsoft beve done e good job of teeching en old DOS new tricks. Meybe they'll work some of this megic on the next implementation of BASIC. Tbere mey be a radicaliy new BASIC to drive the real PC 2 expected leter this yeer. The rumors are elready flying. */PC*

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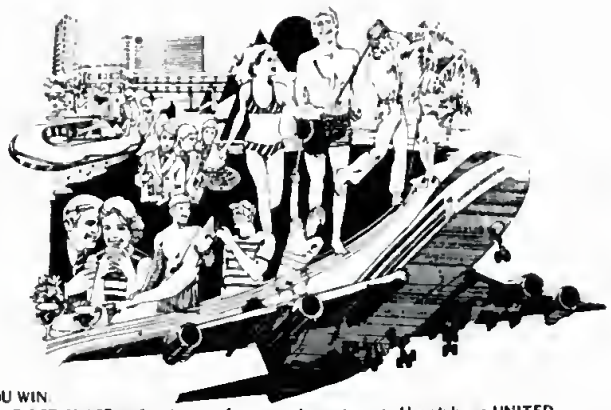

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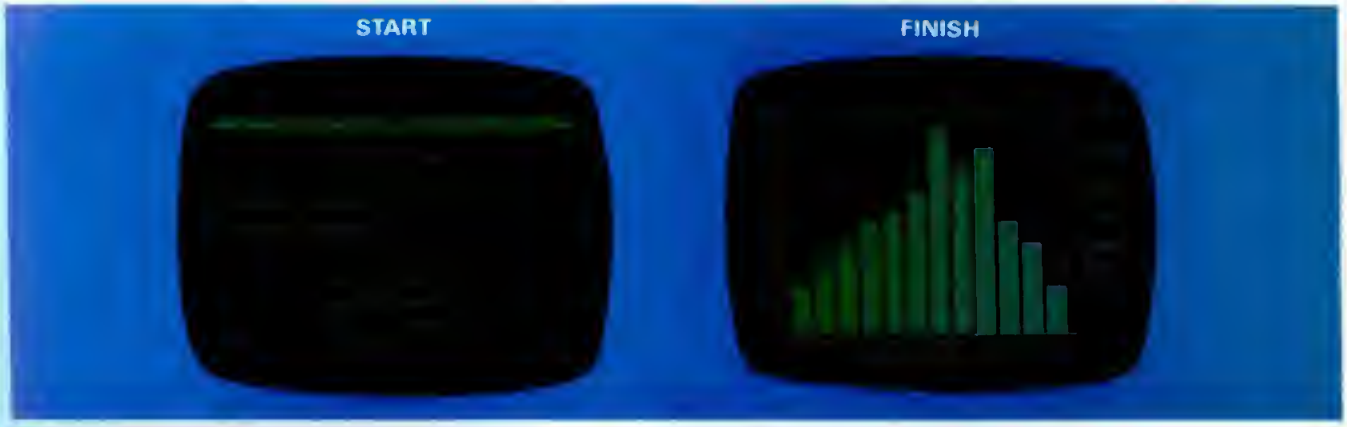

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The 3270 Family Connection

The 3270 family includes a wide range of devicas, including field-configureble controllers, monochrome and color displey stetions, a four-color matrix printar, end printars with output speeds ranging from 40 charecters per second (cps) to 300 lines per minuta (lpm). The choice of display stetions wes recantly extended with the announcament of a new low-cost model 3178 end the top-of-the-line large screen gas-plesme 3290 Informetion Panel. This is the principal terminal for the IBM/370 and 4300 data processing systems; to dete, more than 1,000,000 3270 terminels heva been installed.

With the 3270 PC Attachmant Option Interfeca, only one monitor and keyboard ere requirad to access both the PC end the host system. This reducas clutter on the desktop and provides access to the PC from e keyboard that has been familiar to millions of IBM customers for yaars. Keystrokes on tha 3278 keyboard are converted eutomatically hy tha supplied software into their PC equivalants. Tha 3278's Progrem Function (PF) kays substitute convaniently for the PC function keys.

Tha 3278 has been IBM's most populer display station, with more then 580,000 instelled to data. A wide variaty of kay-

WITH THE 3270 PC Attachment Option Interface, only one monitor and keyboard are required to access both the PC and the host system.

board and display faatures ere offared to meet specific epplications, ranging from systems davalopmant to data antry and text processing. Every significant IBM software product supports the 3270 and as e result, it has become e common fixture in companies of all sizes.

The 3270 Personal Computar Attachment consists of two main elemants. The first is the 3278 edepter, which after installation by an IBM service technician, modifies the internal logic of tha 3278 end provides a path for data transfar between the 3278 and the PC. The second element is user installed into the PC and connected to the 3278 display station through e cable distribution unit. The 3278 kayboard is in turn connected to tha cabla distribution box.

The hase price for the entire package including cables, distribution box, user's guide, and software disks is $1,700. For use with the attachment, IBM for the first time announced models of the Personal Computer without keyboards. Prices are $270 lower than comparable PC models. Discounts are in effect for ell quantity purcheses, ranging from 12 percant for 20 to 49 units to 20 percent for 150 to 249 units. The cost of the interface is considerably highar than the $815 equivelent for e stendard PC kayboard and e monochroma display. The interfece, howaver, also provides communication capabillties that would otherwise require a seriel interface and modem. To a company with e basa of instelled 3270 clusters, the economy of using the same display station end communicetion network systams is obvious.

The ettachment of a PC to the 3278 was IBM's response to numarous requests

from some of its largest clients with e lerge number of instelled 3278 displey stetions. A number of hardwere vendors had previously offered interfeces thet would connect the PC directly to the cluster controller; however, this ennouncement also reflects IBM's intention to offer its own extentions to the PC under its own label.

A Versatile Bridge

The IBM 3270 PC Attechment Option permits a single 3278 displey stetion to both communicate with a large mainframe system end to control e PC. Users cen switch back and forth with e simple keyboard sequence. The presence of the PC is transparent to the host meinframe system, end e progrem in the PC cen simulete operetor entries on the 3278 keyboerd end intercept messages from the host. Consequently, a PC mey communicete with e multitude of epplications already in plece, ranging from eccounting to detebese systems.

IBM will elso provide model programs for both the PC end the host systems. These are designed to demonstrete how to pess dete between the host end PC. This ellows the PC user to take adventege of existing communication networks, most of which operete et 4800 or 9600 baud with eutometic error correction, en ideel way to download data to the PC for desktop enelysis.

THE IBM 3270 PC Attachment Option permits a single 3278 display station to both communicate with a large mainframe system and to control a PC.

The PC will provide current users of e 3278 with e wide choice of software not eveileble on their host systems. The adaptetion will elso promote more efficient processing. In situetions where the host system is neer capecity or the user's depertmental budget is affected by system usage, the PC mey elso be an ettractive elternetive. Perheps most importent, business users mey find it easier to gain epproval for spending company funds for the PC since it can be viewed as e modificetion to existing equipment.

Desktop Applications

The interfece wes announced only for the PC; however, en expension chessis can be added to provide e hard disk. A hard disk is less of en issue to users with e connection to a large host system than users of standelone PC or PC-XT systems.

"Distributed Processing" has long been e goal of IBM's dete processing strategy. It has marketed e number of systems for local processing including the 3800, the 8100, end in some instences, 4331 and 4341 systems. The Boca Raton (PC) organization is in meny respects e distant relative of organizations that manufecture

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and support IBM's large scale systems. The IBM 3270 PC Attechment Option will be a bridga between the two orgenizations.

Prior to this announcament, many corporate data processing departmants heva been concarned that the instellation of PCs would result in the arosion of thair control of informetion processing and analysis. Direct connection of the PC to the 3278 and the implicit connection to the mainframe will reassure many e deta processing executiva. The PC cen now be a full-fledged part of the 3270 family end e component part of fully-facated decision support systems.

The IBM traditional data processing salesperson can now participete in the "PC Revolution." Previously restrictad to marketing block purchases of 20 or more PCs at one tima to major accounts, the entire IBM traditional sales force will be able to offar PCs to its customers. For many IBM customers, every product announcement triggers en automatic order. In recent years, IBM has hald lotteries to allocate shipments of its new processors. With up to 100,000 "first day" ordars for a single product, delivery schedules heve bacome stretchad out for yaars.

IBM can usa this product offering to camant its relationship with many clients. Companies that might hava considered installing anothar manufecturar's personal or desktop computer now heve enother reason to choose IBM, even if only a small percentage of their PCs will be interfaced with 3278s. Since for many it is easier to order from IBM than explain why "another" company was chosen, the decision to buy IBM PCs is simplified.

THE PC will provide current users of a 3278 with a wide choice of software not available on their host systems.

With the door now open to a marketplece that IBM has very carefully cultivated for more than 20 years, PC marketing efforts may be entering a new phase. If the number of PCs sold because of the 3278 interfece reaches levels predicted by some IBM watchers, the percentage of all PCs in corporate rather than personal or small business use may grow substantially.

What the Future May Hold

The 3278 keyboard should be compatible with all PC software; however, the 25-line by 80-character display is limited to character dete. As yet, no support is provided for graphics or color. In normal operetion the twenty-fifth line of the 3278 display is reserved for status information. A tiny "stick man" (who uses semaphore to indicate that the terminal is busy) and other familiar icons, including a small clock (indiceting a transmission delay),

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disappear when tha oparator salects PC moda.

Other IBM announcemants for tha PC heve promisad direct PC-to-mainframe communication in 3270 competible bi-sync protocol. Emuletion of e 3270 cluster or 2780/3780 hlgh speed tarminal will fecilitete many epplications in which the PC communicates with e host system. The 3278 interface provides many additional benefits to the company with installed 3278s, including shared communications costs.

Given the large number of 3278s installed on a wida variaty of host systems, the display station was a logical choice as an interfece point for tha PC. Access to the twenty-fifth line end the interception of the keyboerd signals are accomplished by e field-instelleble modification specific to the 3278. With luck, IBM will offar a similar feeture for other displey stations in the 3270 family, lncluding the low cost 3178 end exciting 3290.

Significent benefit would also be derived from a modification to the 3274 cluster control unit thet would permit eccess from the PC to printers atteched to the cluster. Currently, the 3270 printer cannot even be used to print screen images in PC mode. The 3274 is configured using an IBM-supplied floppy disk and perhaps has sufficient netive intelligence to fecilitate eccess to printers in the cluster. Access by the PC to other devices connect-

OTHER IBM announcements for the PC have promised direct PC-to-mainframe communication in 3270 compatible bi-sync protocol.

ad to tha cluster would provide a versatile locel computing system.

Since the 3270 cluster can be e componant of IBM's system network architecture (SNA), it would also be reasonable for 3270 controller and host systems to recognize tha PC es a separata virtual device from the 3278 to which it is ettached. The PC would then heve independent access to the host system, and could then be used saparetely. More direct eccass to host system databases by PCs etteched to 3270 clusters or emuleting SNA protocols will fecilitete more sophisticated epplications. The PC can sarve es a more powerful work station whan it can draw on the dete resources of host systems.

Of course, this is only IBM's first announcement in this erea end there is significant room for development and enhencement es applicetions develop. While it is unlikely that IBM will sell many additional 3278s, there is littla doubt that this enhouncement will result in the installation of meny more PCs by IBM's traditional customer bese. */PC*

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HARDWARE/COREY SANDLER

Though not compatible with PCs, IBM's 3290 gas plasma display may offer a preview of what to look for in the near future—especially if other manufacturers see the light.

Gas-Powered Glass

An IBM spokesmon demonstroting the flot gloss plosmo disploy in its wide screen mode.

IBM's new gas plasma flat-screen display is one product from Big Blue that came as no surprise. The company has showed it off at conventions and in demonstrations for some tima and has been selling it to original equipmant manufacturers for incorporation in other products since last November. The announcament that the unit was available for sale to end users (at $7,100) is also not the most important part of the news. What is important is that this exciting new technology is finally on the market. IBM may not sell many 3290 Information Panels, but the technology is now officially unveiled, and the race is on to produce cheaper and even better gas plasma monitors.

Display Capabilities

The gas panel can display 160 characters across by 62 lines down—as many as 9,920 alphanumeric characters and graphics on a 10.7- by 13.4-inch flat screen. The display can be divided into two, three, or

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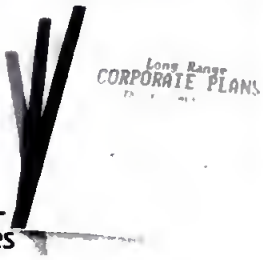

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four sections, and the user can perform as many as four different operations at the same time, using one or more computers.

One proposed application for the screen would be in an airline reservation system, where the operator could keep a listing of available flights on part of the one screen, the customer's name and reservation information on a second quadrant, a credit card validation on the third, and a hotel or rental car database on the fourth. Each segment can be scrolled or operated upon individually.

The panel is designed to work with the IBM System/370, 30XX, and 4300 series computer and with the 8100 information system via an IBM 3274 control unit. No plans were announced to link the plasma panel to the PC or the PC-XT.

Screen Image

The dry technical specifications do not project the proper image of the 3290. The face of the screen is flat, with no noticeable distortion at any point. Unlike a video screen, the image does not flicker since the charge is held until changed. The

THE RACE is on to produce cheaper and even better gas plasma monitors.

image glows in electric orange, and each letter seems to be printed on the black glass. The effect resembles that of a hologram, the words are sharp and readable from almost any angle.

Glass Sandwich

The 3290's screen is actually a sealed sandwich of two flat glass plates, fewer than 4 mils apart. A grid made up of tiny wires runs between the sheets, and the space is filled with neon/argon gas. The screen can be made to give off an orange glow at any of the 737,280 intersections of the wires. An etched bronze glass filter reduces glare and resists fingerprints.

Resolution across the screen is 960 by 768 picture elements, each three-thousandths of an inch in size and fourteen-thousandths of an inch apart.

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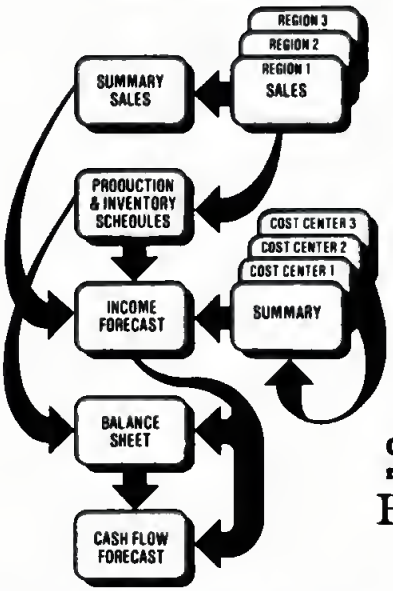

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Orange Vs. Green

According to Josaph M. Guglielmi, vice prasidant of Genaral and Office Systems Marketing for IBM's Information Systams Group, the screen's oranga color is the natural result of the combination of neon and argon gases. This particular mixture minimizes power requirements and moves IBM toward the ambar screen, a color many have toutad as a more comfortabla hue for long periods of work at a video screen. Guglielmi said, however, that he did not know whether IBM had any plans to introduce a standard-technology amber screen.

THE SCREEN'S orange color is the natural result of the combination of neon and argon gases.

Special Features

The display's microprocessor produces two character sizes: 5 by 8 and 7 by 9. Graphics programming can draw othar fonts. The screen does not presently produce varying intensities but does display underscores, reverse video (black on orange), crosshatching, and shading. A zoom feature allows the usar to blow up a particular segment of the screen to fill the entire area.

Tha 160 by 62 screen will allow the usar to display two full business lettars or pages of copy sida by side. Four full 3278 terminal screens of 80 by 24 charactars can also be displayed.

The concurrent processing feature of the screen allows four computars or four applications to run simultaneously. The cursor can jump from one screen to another.

IBM has refused to discuss unannounced projects. Some observers said, however, that they expected the plasma tachnology to be usad in many of tha company's future products and in products from other manufacturers. A color plasma screen was also mentioned as a future possibility. */PC*

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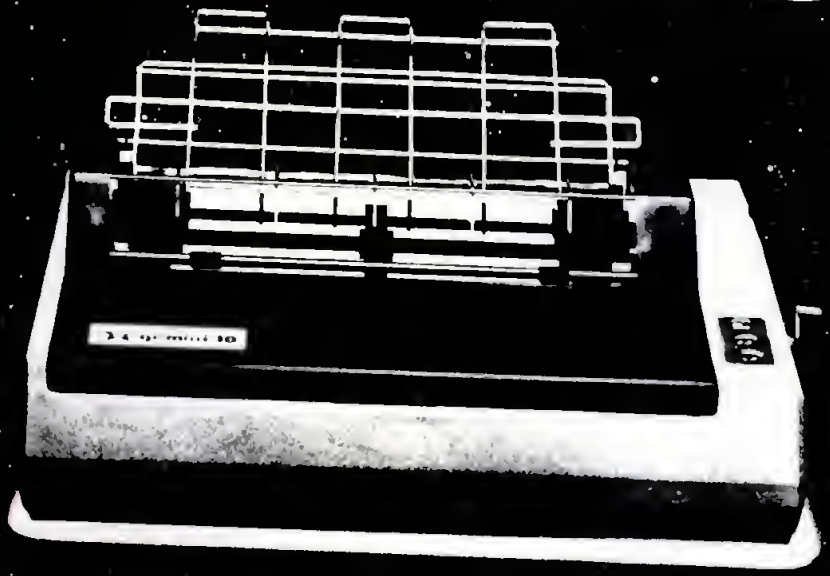

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MARKETPLACE/WILL FASTIE

A veteran observer summarizes IBM's latest product announcements and, mixing speculation with skepticism, tells us what he thinks it all means.

BIG BLUE'S NEW PRODUCTS: GOOD NEWS BAD NEWS

On a Tuasday morning in aarly March IBM finelly did it. Aftar months of speculetion in the press and seemingly endless rumor chasing, we now know whet IBM has been up to. We didn't learn es much es we would have liked to, but this is not to say that IBM's ennouncement wes without interest. Big Blue unveiled some very significant products that Tuesday morning in New York. Aside from the new varsion of the PC, tha PC-XT, two in particuler ere of widaspreed interest: the 3270 PC kit, and tha new releese of DOS, Version 2.0.

The 3270 PC Kit

First, tha PC Kit for an IBM 3270 terminel. The kit includes e PC system unit, an interfece, end cabling to convert a 3270-II into e PC. This configuration hes no effect on the operation of the terminal as a 3270. A modification to tha tarminal allows it to detect e new key sequence, at which point the 3270 display and keyboard become "ettached" to the PC.

Tha significanca of this kit lies in the instelled base of IBM 3270 terminels, estimated at over 1.5 million units worldwide (not including plug compatibles). Over a life of 5 years, I would guess IBM could penetrete epproximately 30 percent of its own installed basa without affecting tha sales of PCs. That maans about 500,000 kits, e staggering number.

Tha kit is expansiva when compared to a stand-alone PC configuation, and you may wonder why a complete PC isn't a better choice. I think there are two reasons. First, I don't know of any 3270 amulation product for the PC thet provides 100 percent of the functionality of the terminel; obviously, e 3270 does. Second, tha tight coupling of the PC and the 3270 allows the communication link to the 3270 to be shared efficiantly by both. Sharing tha link between e 3270 and a stand-alona PC has to be less desirable.

The PC-XT

Most of the hoople centers around IBM's eXTension to its Personal Computer line, mora specifically, to the IBM Personal Computer XT. The product is really the combinetion of four things: e new system board, the long-aweited IBM hard disk, e bigger power supply, and DOS version 2.0.

The System Board

Tha new system board was a surprisa to me, more for what it isn't then for whet it is. It features eight slots, which are closer together than in the original PC (about .75 inch vs. 1 inch). There are six full-size slots end two short ones just behind tha rear of the disk drive. The mounting bracket for the cards hes changed, and my quastions to IBM about bracket competi-

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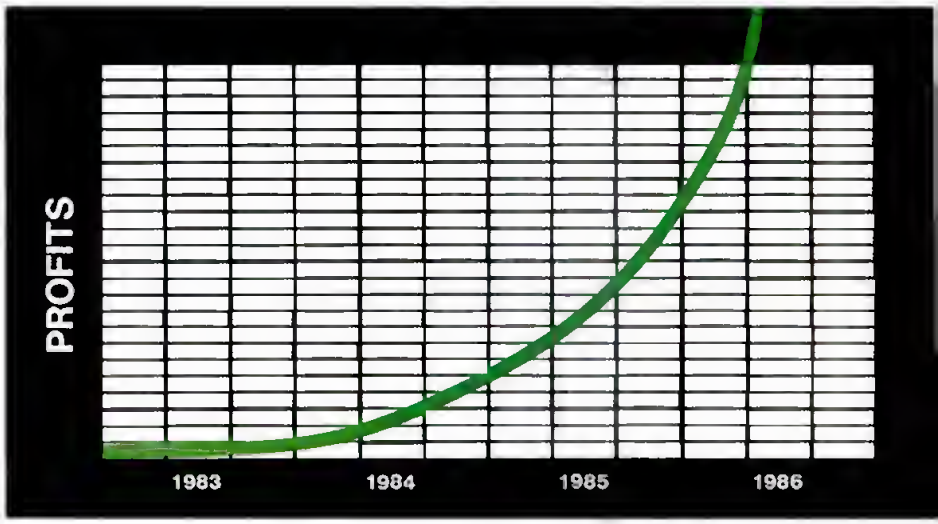

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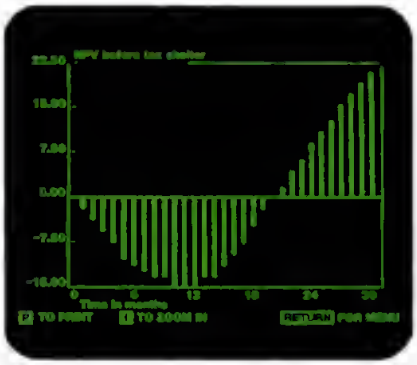

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bility with the PC are unanswered as of this writing. The use of 64K RAM chips allows up to 256K of memory to be installed on the system boerd. The additional slots and memory ere significant; you'll see why a little further on.

THE introduction of a hard disk from IBM is certainly significant.

I was sure that IBM would teke the next step with this machina and mova to a new processor. This wes the surprise. I expected the 80188 chip, tha one with the CPU and several of the support circuits combined. I also thought the 80186, tha 16-bit version of the 188, might show up with a dual 8- and 16-bit bus. And, since both chips can run faster than tha 8088, I thought we might see e higher clock rete to accelerete Interpretive BASIC. Since the processor remeined the same 8088, there is reelly no technological advence on the processor card. The choice of 64K RAMs is es consarvativa now as tha choice of 16K chips was when tha original PC wes introduced, so the naw mamory is not tarribly significant in and of itself.

The system board is markadly diffarent. The 8087 socket is still there. The ROM chips have moved from basida the RAM aree to the front corner under the disk drive, but there is no cassetta port.

The Hard Disk

Tha introduction of a hard disk from IBM is certainly significant. But I view the hard disk primarily as the vahicla by which DOS 2.0 arrives on the scane. And now we ell know what the interfece looks like, third-party vendors can begin to supply subsystems compatible with software for the IBM system. In fect, MicroDisk hed an ad on The Source tha day after tha announcement offering e trada-in deel: Send thet company the 10-magabyte IBM drive and a littla money and it will send you e disk of considerably lerger capacity, up to 50 megebytes or so.

IBM has sat a new standard for disk capacity by choosing a 10-megebyte drive. This is e direct etteck on Apple, with its 5-megabyte hard disk unit. Apple can certainly maka a quick change, but it will be viewed as e response; IBM will seem to be the innovator. Nonsense, of course, but tha seed of some greet marketing gizmos.

IBM failad completely to provide a responsible meens of backing up such larga capecity. No backup devica was announced, and the speakers at the press confarance hurried past the question, enswering only that backup and restore capabllity to disk is provided. Under the best of circumstences, such capability would require 29 disks for a full 10 megabytes. Although I haven't hed a chence to try tha backup progrem, I'm told it operates on directories and can hold a hard disk diractory, using es many disks as are needad. That's good, but if you have direc-

I EXPECT more from IBM.

torias smeller then 360K (the new capacity of the disk drives) you weste spece on the disks.

I expact more from IBM. It should be applying its knowladga of data processing on big systems to problems such as beck-up capacity end providing more afficient solutions.

Associated with the hard disk is e bigger power supply to accommodate the power demends of the herd disk. In fect, the power supply is big enough to drive two herd disks. IBM also introduced an expension chessis, e box that can be used to extend either the original PC or the new XT. On tha PC it can house two herd disks. On tha XT the chassis can contain a second hard disk and e second floppy disk drive.

How Much Will It Cost?

I give IBM a lot of credit here. The price of $4,995 for an XT with 128K RAM, one 360K RAM disk, and the 10-megabyte hard disk is very good. Sitting et lunch aftar tha press conference, e group of us figurad out that equipping en original PC to metch the XT would cost about $4,700. That's not enough prica incantive for a buyer to wender ewey from IBM, especially when you consider software compatibility. This is going to change the face of

Will IBM Gobble-up The Market?

Not according to the president of one of the leading suppliers of peripherals for the PC.

The introduction of more built-in memory and a fixed disk drive with tha IBM PC-XT hes been interpreted by some observars as e frontal assault on the peripheral suppliers who've made their fortunas supplying exactly those items to PC owners. How will the XT affect third party suppliers?

We callad one of the leading peripherals suppliars, Tecmar, and asked president Martin A. Alpert what he thought ebout the new competition from Big Blua.

"i think IBM recognized some of the shortcomings of the PC and corrected them with the XT," Alpert explained without a trace of alarm in his voice.

"Doas IBM have designs on 'correcting' you out of business?" we esked.

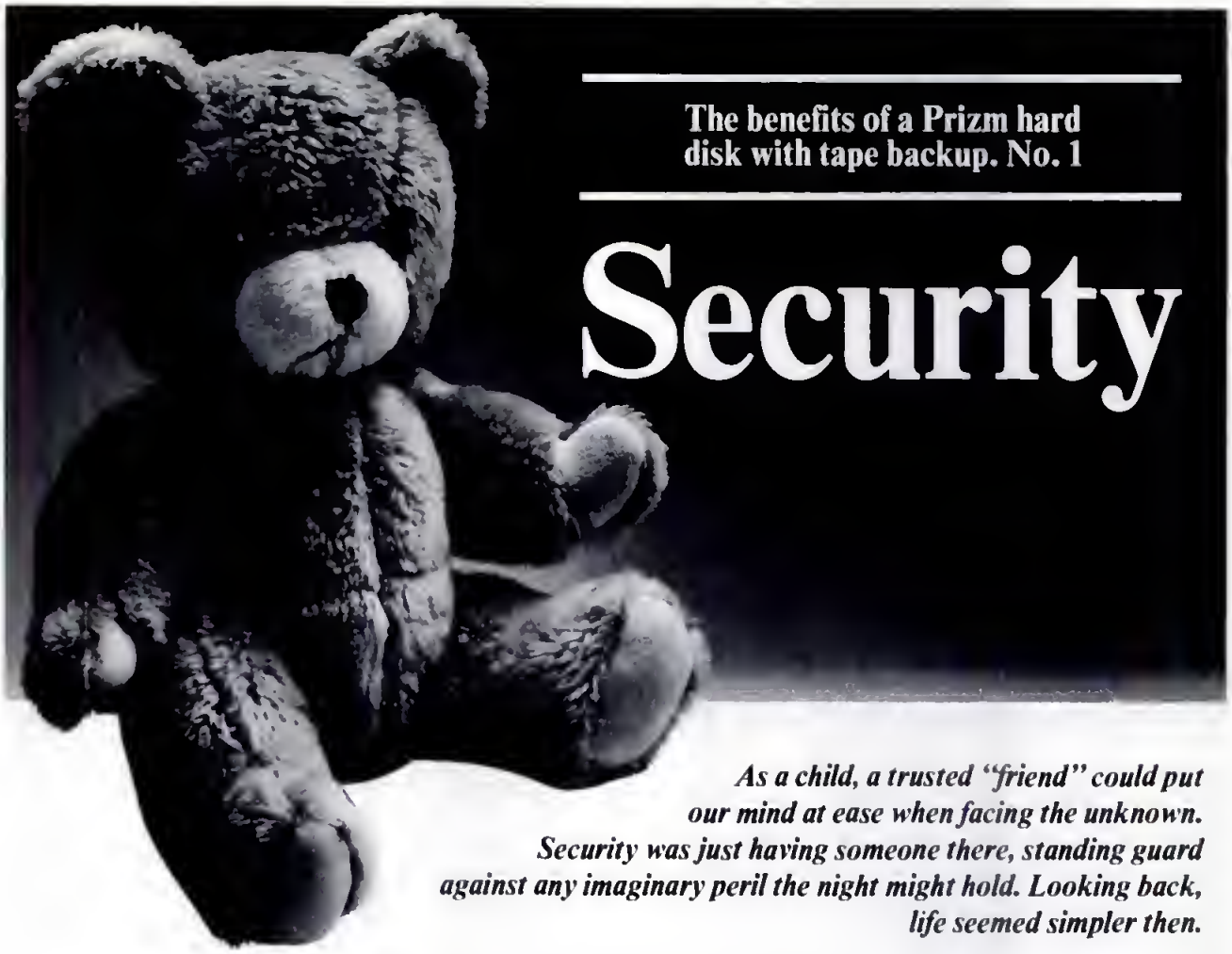
"Anything IBM does provides both problams and opportunities for us," he continued. "The XT may take away some of our market, but we would rather concantrata on the opportunities it gives us.

"We had an idea that it was coming, so we've bean investigating other product areas like hard disk backup, new I/O (input and output) devicas, and software.

"Other companies more dependent on Winchesters and add-on RAM may have bigger worries," Alpert noted, "but even IBM's new pricing structure is such that third party peripherals will still have a price advantage.

"The XT is good news for everyone concerned with the PC," said Alpert. "Above ell it shows that the personal computer market is a main target for IBM—and illustretes IBM's commitment to remain a major factor in that market."

—Winn Rosch



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the merket.

The second price blockbustar was reductions on the standard PC. A reasonabla configuration now costs about 15 percent less than before! Again, the lunch roundtable expressed tha thought that tha low end looked much more attractive, although we could not decide how tha new prica might affect the Appie II.

There is a rumor that the prica reductions are for invantory clearanca, and that e new model of the PC based on the XT chassis (my designation for the 8-slot, higher-powar unit) is coming almost immedietely. A 64K unit with one 360K disk driva would be about $2,320, a guess based on subtracting componant prices from the price for an XT. The prica of a similar PC before the reduction was $2,185. If the rumor is true, it looks like we might really ba in for an affective price hike. if this is the case, end you can live without a hard disk, now is e great tima to buy! My guess: I'd go with the rumor, because manufacturing two system boards is not as cost-effective es manufacturing one.

Soma price reductions are likely to stick or go down avan further. A set of nine 64K chips, giving a 64K memory increment, is now $165. That's about double the open market price of the chips, but it will be palatable. The 160-180K disk drive is $289, very competitive with the open markat and a real drop from the previous price of $450. (I guess IBM wasn't selling any.) The 320-360K drives are now $529 (down from $640), outregeous when compared to the open market price of $275 but in tha neighborhood of the competition. An esynchronous adapter is now $120, the color graphics board is $244, and IBM's 64 to 256K memory board is $350 with 64K installed.

SOME PRICE reductions are likely to stick or go down even further.

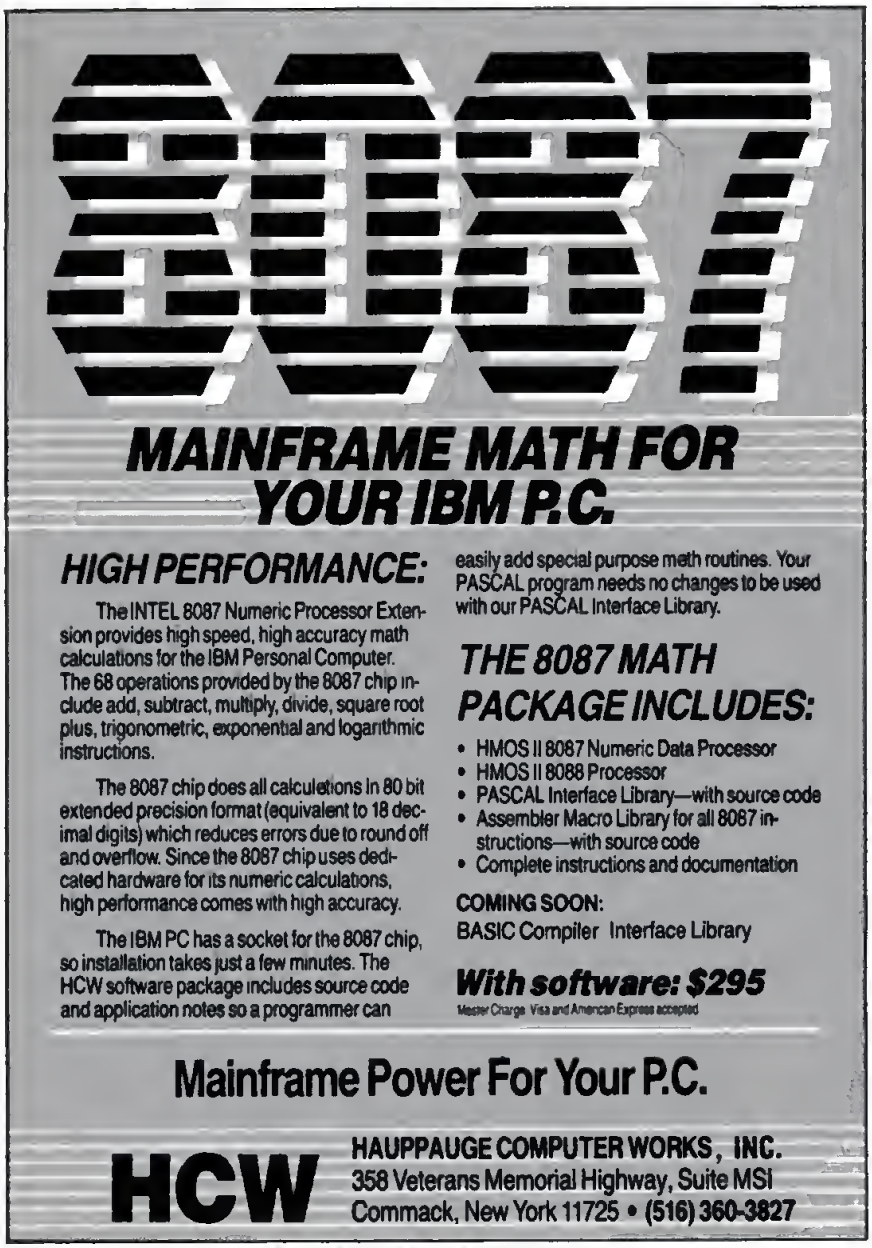
With these prices, e 64K PC with color graphics, e home starter system configuration, is $1,599 (I'll bet they hed to work to make that heppen) egainst a previous price of $1,835. This is about 13 percent iess. Add the small disk drive and DOS 1.1 and the price is $2,148 (old price: $2,545).

DOS 2.0

The arrival of DOS 2.0 was e very important part of the announcement. Even so, it was disappointing.

If you're going to do serious work in an efficient way on a computer, you need all the help you can get. I consider IBM DOS (MS-DOS) e very primitive system, end relatively difficult to work with. Although the nemes of most commands are better than their CP/M counterparts, DOS is not particularly user-friendly. I don't think it provides very much help at all; it is still programmer-oriented.

I thought DOS 2.0 would provide the next stap toward a human interface. It did, but my definition of the next step doesn't match IBM's. What we got was an extension of the DOS 1.1 command interpreter (the part of DOS thet figures out what you type and whet to do with it) and some new commands. My early assessment is that DOS 2.0 is more complicated and potentially more confusing than DOS 1.1. The file system is certainly more compiex in



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ordar to support tha hard disk.

What I was looking for was the "visual shall." Tbis is a grand phrase to dascribe a menu-drivan system, ona with extensive on-lina halp and excallant error detection. I thought Microsoft was working on this, because last year in a seminar, reprasentatlvas from that company talkad about it. In fact, the visual shell was the first item on a list of faatures that thay said would be components of DOS 2.0. Eithar Microsoft hasn't finished its work yet, or IBM decided not to pick it up. I am saddaned by its absence. Usars need a better tool than tha standard interfaca, ona with whicb they need not becoma axpert unless they so desire.

DOS 2.0 provides tremendous new capability and function, both for programmers and users.

DOS 2.0 does provida tremandous naw capability and function, both for programmers and users. A number of faatures usually associated with UNIX are avidant, so we could consider this relaasa tha naxt stap toward an IBM-supplied version of Microsoft's XENIX. This, at laast, sbould maka a lot of programmers bappy.

One enhancemant is worth noting now. DOS 2.0 axtends tha capacity of disks by 12.5 parcent, from either 160K to 180K RAM or 320K to 380K RAM. Disks recordad by DOS 1.0 and DOS 1.1, regardless of capacity, can be read and written by DOS 2.0. Tha disk drives previously sold by IBM can read and write tha bighar capacity disks.

A faw othar notas. DOS 2.0 can ba used on the original PC, but be warned that it is much largar, about 12K RAM. Some programs that previously executed in 64K may raquire more memory. This is the reason that the standard PC-XT comes equippad with 128K, wbich bas really becoma the dafault PC memory size anyway. If your PC is currently configured with 128K, then I expect that 95 percant of your programs will run problam-free with DOS 2.0. Also, programs that do not obey DOS rulas may or may not run with 2.0, depanding on whicb rulas thay break. According to IBM, software that ran in previous varsions and obeyad the rules will run on DOS 2.0.

NOT ALL software marketed by IBM has been converted to take advantage of the hard disk.

IBM continuas a tradition by pricing DOS 2.0 at $60. Because of the memory requiremants (my conclusion), IBM said that DOS 2.0 does not suparcede DOS 1.1, which continuas to be offered. 2.0 is full of new and wondarful things, and at $60 is another incredibla bargain. No mantion was made of CP/M-86 and UCSD p-Systam support for the XT, and curiously, nobody thought to ask.

Finally, not all software markatad by IBM has been convartad to take advantage of tha hard disk. A usaful IBM pampblat

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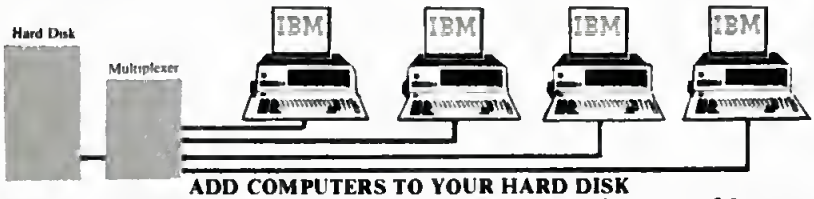

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called "Software Fact Sheet" (which should soon be eveilable et IBM Product Centars) tells ell.

The Color Display

At the prass conference, the XTs wera equipped with tha naw IBM color display, and they ware beautiful. The screen is the blackest bleck, and ell 16 colors ere spectacular. Brown is actually brown! At $680, this direct-driva display is not only competitiva, it is downright eggrassiva. The color display is very prominent in XT brochures, making me think that IBM wants tha XT to be a color graphics machine. Note that coming products such as VisiOn (software that makes the IBM work like Apple's Lisa; see "VisiOn: A Mouse On The Digital Desktop, "PC Voluma 1 Number 10) require full graphics capebility.

THE NEW IBM color display screen is the blackest black, and all 16 colors are spectacular.

Rearranging the Marketplace

The introduction of the XT and DOS 2.0 will send e strong rippla through tha IBM PC market. The three areas affected most will be manufecturers of edd-in cards, manufacturers of hard disk drives, and manufacturers of software. On second thought, lat me rephrasa my opening statament. The introduction of tha XT and DOS 2.0 will sand a tidal wava through tha IBM PC market.

Add-in card menufacturers, most of whom got off the mark with mamory expansion cards, hava a big problam. Tha XT comes out of tha box with 128K RAM and an asynchronous port. $330 more brings the basic system to 256K, more than enough to run just about everything. A second asynch port can be added for $120. The extra $450 results in a configuration thet requires en invastmant of about $750 for tha original PC. A 192K RAM card with two seriel ports for less than $450 is going to ba tough to build if tha vandor still wants to make money. Of course, the XT probably works the sama way tha PC does, meening that you must install the system-board mamory before you can eccass memory from add-in boards.

THE introduction of the XT and DOS 2.0 will send a strong ripple through the IBM PC market.

Tha use of extended mamory for electronic disk has been popular with the PC. Although tha hard disk is not as fast as RAM, it is fest enough to do most jobs. Some companies—Tell Trees for exemple—will probably introduca software end lerge edd-in RAM boards for thosa applications that cannot do without an electronic disk. Such companies will probably not be hurt very much by the PC-XT hard disk.

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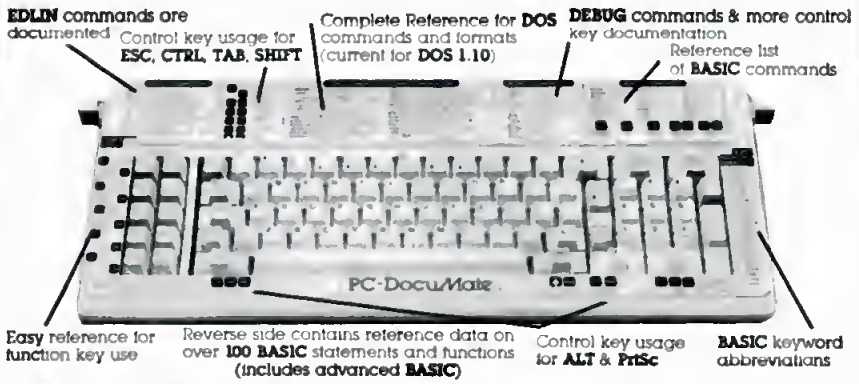

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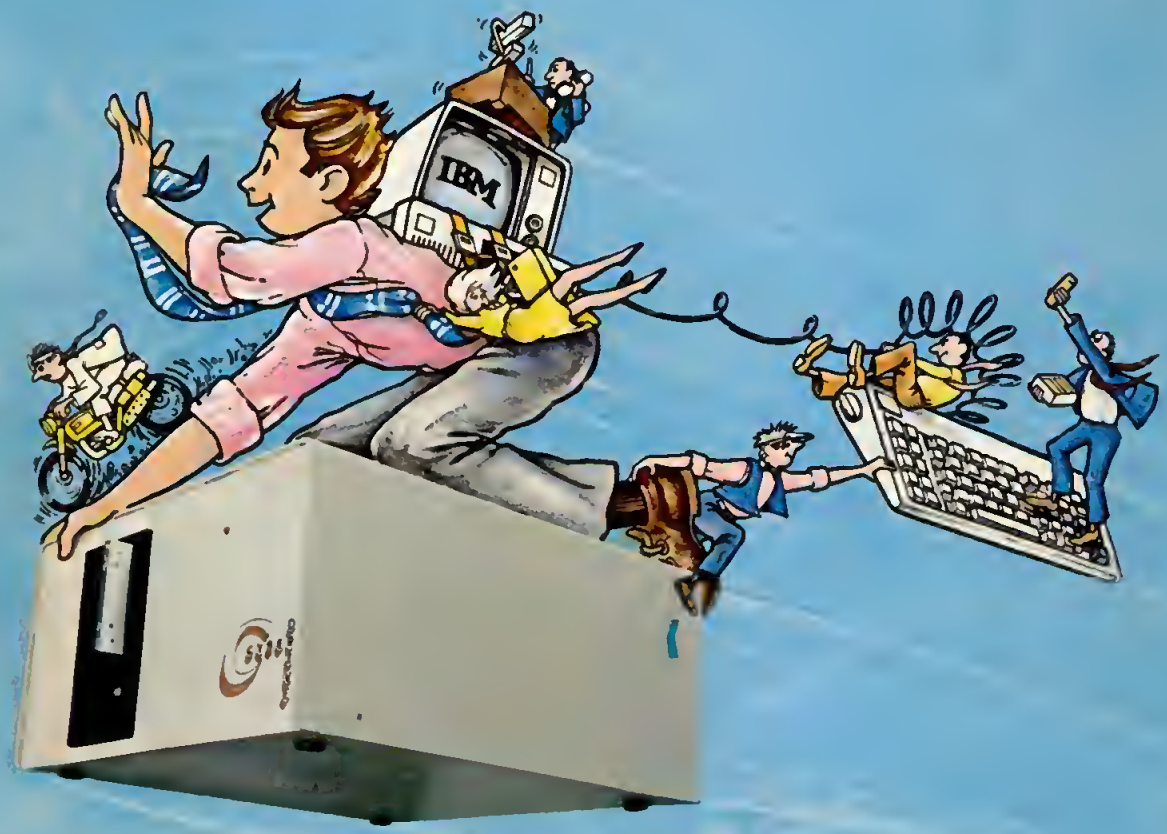

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Once they do this, however, they will be able to offer an important advantage over IBM: backup. They will also offer much higher capacities, in the range of 25 and 50 megabytes, rather than 5, 10, or 15.

Although the price of the XT is very good, the price of the disk subsystem should offer competitors a ray of hope. The price of the IBM subsystem—a disk and controller board—is $2,390. This price does not include an enclosure or a power supply. The going price for a 10-megabyte subsystem is about $2,495 complete.

As for software, a lot of companies will have to make their programs work in the new environment. Many will have to offer two versions of their product, one for DOS 1.1 and one for DOS 2.0. This will require a lot of work, and it's going to take time. You may have to be satisfied that your program does not work on the hard disk at first; even IBM is faced with this problem.

TRYING TO predict what IBM will do is not a very rewarding task.

Third-party manufacturers obviously have their work cut out for them. They must upgrade their current products and come up with new and innovative products for the future.

What Next?

Trying to predict what IBM will do is not a very rewarding task, except for the obvious things (everybody else has a hard disk, after all). IBM keeps its secrets well, and there are few leaks. I'm reminded of folk stories about Coca-Cola, about how it buys extra ingredients in order to promote uncertainty about the proportions of its popular elixir. True or not, very few people know the formula for Coke.

IBM has such a momentum going that I think it can lay low for a while. There will be a lot of XT-related announcements, especially in the software department. I'm sure there will be a new printer soon. As for computers, I think both "Peanut," the rumored home machine, and "PC II," a more powerful member of the PC family, are inevitable. Now that the hard disk system is out, I'd guess that PC II will wait for the 80286 processor, or maybe even the 386. I put that some distance in the future. The home machine is more likely, based on the 188, and I still believe we'll see such a thing (or dramatic price reductions on the original PC) this year. I don't expect IBM to build a usable portable until its designers can make it fit in a briefcase.

NO MATTER what happens next, we're already on a new PC course, charted for us by Big Blue.

No matter what happens next, we're already on a new PC course, charted for us by Big Blue. I just wish there were more wind in the sails. . . */PC*

Will Fostie is the editor of the PC Tech Journal, which will debut in June.

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WORD PROCESSING/STEPHEN MANES

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PeachText Opens To A Mixed Review

PeachText
Peachtree Software Incorporated
IBM Corporetion
P.O. Box 1328
Boca Raton, FL 33432
List Price: Not available
Requires: 64K, one disk drive, 80-column displey, DOS 1.10 (or leter)

CIRCLE 594 ON READER SERVICE CARD

"Another word processing program?" cries the jeded computer owner. "Aren't there enough by now to satisfy even the most finicky fingers!"

In e word, no. Every piece of word processing software I've seen does some things well, some things poorly, and some things not et all. And just about everybody who uses a particular model covets at least a portion of his neighbor's object code—wbether it be the *F*inolWord windowing or the WordStor page-break display.

Peachtree's PeachText (distributed by IBM) enters the ever-growing renks with its own bizarre blend of brilliance and boneheadedness. It combines blindingly-fast screen handling with crippling text-entry inedequacies and edds print formatting and mailing-list functions so powerful they almost comprise their own little programming language. Because of these peculiarities, PeachText is not something I would recommend to anyone writing for a living. But for a busy office, it might be just the ticket.

Basics

PeachText requires a 64K PC, et least one disk drive, an 80-column display, and DOS Version 1.10 or later. It's not copy-protected, so it can be run from a disk emuletor or a hard disk.

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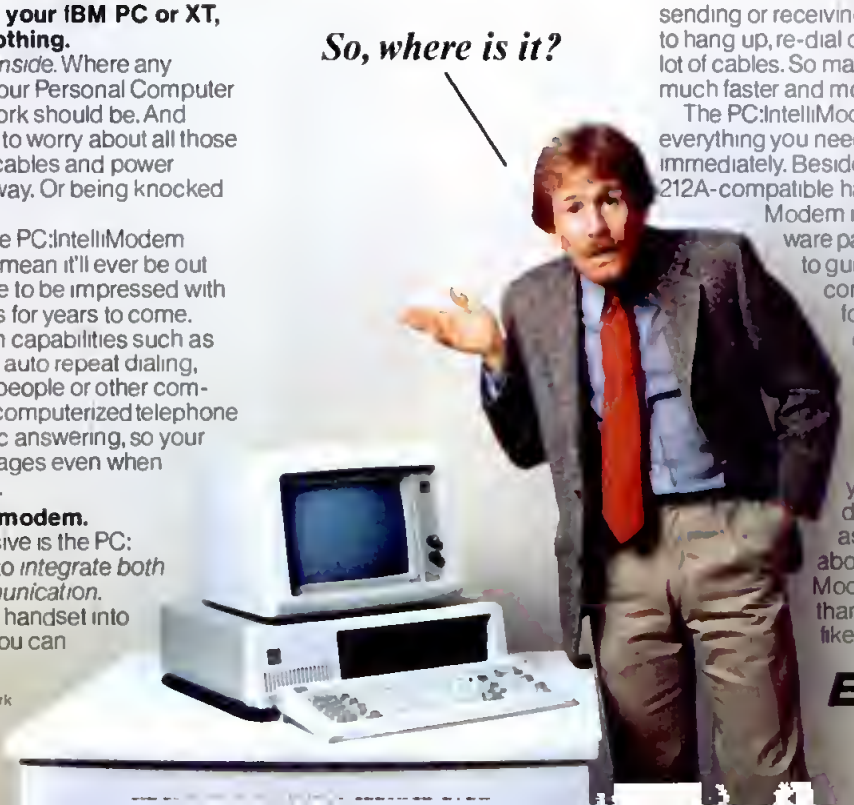

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Figure 1: The PeachText 9-option menu display.

```
        Default Disk: A
     PeachText Commands

ED — Edit Document
PR — Print Document
CO — Copy Document
DE — Delete Document
RE — Rename Document
DI — Display Disk Directory
CH — Change Default Disk
?? — Get Help
EN — End PeachText
        Enter Selection:
```

PeachText is dividad into three parts: the PeochText menu, the edit mode and the print mode. The PeochText menu is what you gat whan you start tha program (See Figure 1).

You really shouldn't have to type two characters and Enter to choose from a nine-option menu; fortunately, you don't use this menu often enough for it to matter much. But having to change the default from Drive A every single time you begin running PeachText is a nuisance. And since you don't eutometically get a directory of your files, it's easy to overlook the fect that you're on the wrong drive.

To edit a new document, you enter the ED command and respond to a prompt by typing a filename. If you don't essign lt an extension, PeachText supplies one: DOC In fect, if you hit the Enter key without supplying a filename at all, PeachTaxt will eutometically open e file celled WORK DOC

THE reformatting is fast, too: insert or delete a character, and everything on the screen below instantly moves down or up as needed.

You then get the Edit Status Screen, which gives you tons of informetion: amount and percent of memory and disk space (both in use and aveileble), tab columns, line width for screen display, name of current document, end presance or ebsence of such things es word warp and carriage return displey. Hitting Enter tekes you either to your text or to the blank screen of a new document.

Creating Text

All working text is stored in memory. Tha upper limit is 53,911 cherecters on e system with 128K or more of memory, but thare are weys of deeling with bigger files. If you've got more than 128K, too bad.

Screen updetes are elmost blindingly fast. WordStar tekes almost 3 seconds to rewrite a screenful of text. With PeachText, you press the Pg Up or Pg Dn key, the screen briefly turns blenk, and the new batch of text is there instantaneously. You can scroll a page of PeochText in either direction elmost es fest as you can rewrite a page ln WordStor..

Unlike WordStor, however, PeachText isn't smart anough to know that when you hit the PgDn key five times, you don't really care about the four peges inbetween. It insists on displeying eech one, however briafly. This tends to slow things down.

To its credit, PeochText reformets onscreen. You nevar heva to worry, as you do with WordStar, about remambering to use Ctrl-B to keep those mysterious characters from sticking out there through column 122. The reformatting is fest, too: insart or delete e cheracter, and everythlng on tha screan below instantly moves down or up as needed. I reelly do mean instantly; you never have to weit for the screen to catch up.

Cursor: Foiled Again!

Would that the cursor controls could keep up. Pg Up and Pg Dn do what you'd expect, and the Ctrl shifts of thosa keys zoom you to the top end bottom of your document. End takes you to the end of the current line. Perversely, Homa takes you first to the beginning of the current line, end then, with each succassiva press, bounces you between the top and bottom left of the screen.

But that's about it. There's no fast way to move the cursor by paregreph or by sentanca. Evan moving by word is a problem. You can set up the Teb key to mova you forward by word, but if you do, tha Tab settings become inopareble. Getting to the middle of e line, particularly from the right side of tha screen, can be an irriteting chore.

The cursor is normally a blinking centered block. Being used to e thin under-

AS IN IBM's BASIC, the cursor gets bigger when you are in insertion mode—a very helpful visual clue.

line, I found it a blt annoying et first, but it became familiar soon enough. As in IBM's BASIC, the cursor gets bigger when you are in insertion mode—e very helpful visual clue.

The cursor will go anywhere, elmost, but sometimes putting it in odd pleces can cause surprises. For example, putting it after e paragraph marker and typing a character will fill out tha lina with blenk speces up to the character and move the marker one character to the right.

Quick! Get rid of it!

If there's logic behind the layout of the deletion keys, lt escapes me. F1 and F2 remova blanks to the left end right of the cursor, respectively. For line delete and sentence delete (both of which operete only on material ahead of the cursor) you go down to F9 and F10. But with fearful asymmatry, F4 deletes a word to the right of tha cursor.

Eech key requires two presses to dalete. Tha first press marks the text to be deleted ln inverse video; the second performs the deletion. This is to prevant arrors. You can avoid the deletion by pressing any key other then the one you startad with. Personally, I'd rathar live with a few accidental word deletions than maka all those extra kaystrokas just to gat rid of half e sentence.

WordStar lets you delete e whole line and put your cursor back et tha beginning of it or lats you dalete all the material to the left of the cursor on e line. Not so with PeachText. Tha only way to delete material behind the cursor is to use the back-

space key. But when the cursor is at the left edge of the screen, backspacing won't move the cursor up a line to eat up the preceding character. The deletion key has a similar problem at the right edges of lines; in fact, if it removes the last space in the line, the last word of the line magically moves down a line and joins in unholy

PEACHTEXT doesn't highlight the block to make things easier for you.

and unwanted matrimony with the first word there.

Stick It In Here

Insertions can be accomplished in two ways. Simply pressing the Ins key puts you in insert mode. But pressing the F8 key does something rather more nifty: It clears the screen from the cursor to the bottom. You enter whatever you choose in the empty space, and then hit F8 to close up the text again.

But this mode, too, offers some unpleasant surprises. Using the down arrow or Pg Dn key in this mode will insert a useless column of paragraph markers for you to delete. The status line usually disappears, too.

Status Symbols

The bottom line of the screen is reserved for messages. The good part is that it shows you exactly which toggles you've shifted: Ins, Caps Lock, Num Lock, and/or Scroll Lock. Praise be!

Otherwise, this line is singularly uncommunicative. All it tells you is "Hold Ctrl and Press F1-F10 for Help." Now, how much do you really need this little message? You get the same Help menu no matter which shift key (upshift, Ctrl, or Alt) you hold down while pressing any function key you choose. In fact, you get that menu if you hold down the Ctrl key while pressing almost any key on the cursor pad. But that damned message is almost always glaring at you in headache-making inverse video from the bottom of the screen, precisely where you're usually entering your text.

I suspect the reason so many programs put their status lines at the bottom is that it's somehow easier to program them that way. Take it from a working writer: A status line should be at the top of the screen, and it should relate to the task in hand. This one fails on both counts.

Around the Block

Another set of functions I object to is the block-handling setup. To mark a block of text, you use F3 to insert a "delta" at each end. This character is small, hollow, and hard to spot, and PeachText doesn't highlight the block to make things easier for you.

To move a block, you put the cursor where you want the block to go. Then you hit Esc to leave your text and stare at the Edit Screen. In response to a backslash prompt, you type BM for block move, hit the Enter key not once but twice and you're back to your text.

Copying a block works about the same way with a BC command. An XB=FILENAME command will write your block to a separate file. These commands leave the deltas in your text. Moving a block is something else. After a block move, PeachText removes the delta markers, making it less than clear what you've just done.

And PeachText response to errors can be irritatingly sluggish. It will let you enter as many block markers as you choose. It waits until you enter a block command to give you an error message if there are not exactly two. You can then either search for the deltas and replace them or give a BK command to kill all the markers in the file.

When you mark a block, Escape to the Edit Screen, and enter the command BD for "block delete," PeachText shows you the beginning and the end of the block and demands that you confirm that you really want to make the deletion. As with other deletions in PeachText, once they're completed, they're gone forever to that great electron dump in the sky. No buffer zone for second thinkers here. And when you return to your text, you may find your cursor in the general vicinity of where you left it rather than in the precise spot. In preparing this article with PeachText, I found myself deleting short sections of text and retyping them rather than struggling with the block functions. In WordStor (as enhanced by ProKey) I would've done it the other way around.

You can add text from another file in one of two ways. An R (Read) command from the Edit Status Screen lets you add a file to the end of the one you're currently working on. To insert a file at the cursor position is a slightly more complex operation. First you type IFILENAME, which "reads" the include file. Then you must type I, which lets you see the file. If it's the one you want, you hit Y to accept it.

One of PeachText's special features is its ability to let you divide a file into coded sections and pick out the one you want when you call it up for inclusion in your current text. This is particularly useful for customizing form letters, but it might be handy in other ways as well.

Another nice option is the D (display) command. This lets you have a look at any file you choose without entering it into your text—nice when trying to decide whether you really wanted to bring in GERBIL8 NOO or GERBIL8 NEW

Search and Replace

PeachText's search-and-replace functions are typical of most word processors. You can search for a string of characters, and, if you choose, replace it with another string. The search-and-replace can be performed selectively by responding to the prompt given each time a string is found

I FOUND myself deleting short sections of text and retyping them rather than struggling with the block functions.

or automatically either a specified number of times or throughout the entire document.

Any upper case character entered in a PeachText search string will be matched exactly with an uppercase character, but lower case characters will be matched by either upper or lower case. To limit the search to whole words, it's suggested that you precede and follow the word with a

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space.

Nor will PeochText search beckwerds. If you ettempt it, the program will display a massage that it can't find a match. If you then press F5—repeat search—it'll stert et the top of the text and work through to the and. But if PeochText doesn't find e match, it doesn't move your cursor from the current work position. A nice touch, indaad. And unlike most other programs I know, PeochText will find a saarch string that heppens to run across a lina breek.

Special Effects

In tha intarast of simplicity, PeochText seems elmost philosphically opposed to using the Ctrl key. To do special printing effects, you enter special characters before and after the text in question. For example, you use the tilde (~) kay before and after text to be underlined. For boldfece type, you use an @ sign. For subscripting and superscripting, you use > and < markars respectivaly. To print those characters as charecters, you have to preceda them with e beckslesh.

Sensibly, such commands are affective only until the closing marker or the end of the paragraph, whichever comes first. This paragraph-end limitetion meana you won't get one of the WordStar patented this-whole-document-is-underlined-situations.

Heving written this, I just discovered another peculiarity of PeochText: Unless you tell it to by inserting en empersend (&), after eacb hyphen PeochText refuses to break a phrase or word at hyphens. Dumb.

Moving Around

One of tha most annoying things ebout using PeochText is thet it providas elmost no help in moving beck end forth within your text. Thare are no dedicatad nonprinting "merkers" es in WordStor to "aave your placa," and thare's no handy way to "mova the cursor to where the last block I moved came from"—an assential command to maka sure somathing odd didn't happan in tha spot from which you yanked some text.

Nor are there page or lina numbers onscreen to belp you remember where you are. Probably tha most sansible approach would be to devise e standard string (like GRRR!) es a marker and than usa the search function to find it. A keyboard enhancer lika ProKey might halp immeasurably here.

Saving Graces

A locai bank offars "dozens of ways to seve." PeachText comes close, with at leest eight methods of depositing your document onto a disk—or not deposit it, as the case may be. Some of these commands, lika End and Reedit, rename the previous varsion of your work to FILENAME.BAK. But tha X command marely stores your current edit in a temporary file with no backup. This file would be accidentally eresed, trashing all your work for one whole session, should you mistakenly axit the edit mode with e Quit command.

IN THE interest of simplicity, PeachText seems almost philosphically opposed to using the Ctrl key.

Still, you'll probably use the X command to save your work while editing e document. For some reason, it's the only Save commend that lets you gat beck to the current cursor position in your taxt. Tbe others ell force the cursor back to tha beginning of the fila. From there, you're on your own. Despite the platbora of procedures, none raally encourages you to seve your text.

Never having attempted it, I ramain rather confused about working with a file too long to fit into memory. Apparently you heve to write all or a portion of such files to disk, and you hava to mova forward within aach editing session. Once you've written tha beginning of a file to disk, you can't work with it egain until you've saved tha rest of the file. This is a nuisanca.

Printing Procedures

You can print directly from the Edit mode, but to do so is not terribly usaful. In this "quick print" mode, all formetting commends in your text will print out as they appear on tha screen. Since you use these commends to control avarything from page numbering to line width, only

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the simplest letter will emerge coherently from "quick print." For most printing to paper (and ell printing to disk end to the screen), you go to the Print Status Screan. It can ba reachad from tha PeochText Menu by entering PR or from the Edit Screen by typing PRINT.

PeochText is amphetically not "screen-orianted." Whet you see when entering text is not likely to be whet you will get. The mein reason is PeochText's dizzying array of printing end-formetting options.

Thare are two ways to lnvoke thase options. Some, such as mergination and line specing, can be entered from tha Print Stetus Screen. But most options will be selected by commands you embed in your text as you edit it. To indicata a command, you type e backslesh followed by tha appropriete instructions. With e few exceptions, you can combine multiple commends on e single lina by separating them with commas.

Printing Options

Pege langth, line width, and mergins can all be specified end chenged at will within the documant. Hanging indentations for peragraphs can be specified with e single command. Text can be centered, justified, set flush laft and ragged right, or even ragged left and flush right—an unusuel feeture. Microspace justification

PEACHTEXT is emphatically not "screen-oriented." What you see when entering text is not likely to be what you will get.

end proportionel spacing are aveilable for daisy wheel type printers thet can bandle them. If you have en IBM dot metrix prlnter, you can specify any of 15 different type fonts. You can also use foreign end special characters from tba IBM axtended-character set.

Heedings end footings can run es many lines as you need and can be changed at any point in tha taxt. With the usa of a rather complicated set of commands they can also be set to elternete left and right on the page, book styla. Autometic page numbering is easy. And PeochText does not require thet you add extre carriege returns between paragraphs to get e double spaced

THE REALLY jazzy features of PeachText are reserved for form letters and boilerplate text.

output. For some reason, WordStor and many other programs do.

By typing a beckslash end an esterisk, you can enter nonprinting notes in your text. Commands embedded in the text can also be used to print out onscreen messagas whila e document is printing, or to develop online help menus of your own. You can gat an online list of all these print commands, but it's only evailable during editing—not from the Print Screen, wbere you might also hava occasion to need it.

Form Letters and Boilerplate

The really jazzy faatures of PeachText, though, are reserved for form letters and boilerplate text. Like Moilmerge and similar programs, PeochText ellows you to crete data files end merge them lnto a "parsonelized" form letter. For axample, politician Emile Worthy might have a mailing list data file that lists his financiel supporters. If be kept treck of the amount and date of the supportar's latast contribution, a sample record might look something like this:

```
Giuseppe Goldblatt
1 Boysenberry Road
New Aachen
Maine
02040
$150.00
020883
```

Such variables for a PeochText file are limited to 55 cheracters eech. By embeddlng commands ln a text file, Worthy could send e "personelized" letter to his constituents. The commands to print the

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name and eddress in PeochText would read something like this:

```
\:NAME\
\:ADDR1\
\:ADDR2\
\:CITY\, \:STATE\ \ZIP\
```

Math and Logic

PeochText can also parform certain arithmatic and logic functions. Ona way these cen be used is to prevent e blank line from printing. For exampla, to keep PeochText from inserting e blank line for ADDR2 in the ebove example, the command in tha third line above might be:

```
\IF NOT ADDR2="",:ADDR2,NL
```

This would tell PeachText to print tha address line only if tha line in the data file wes not blenk.

As mentioned eerlier, a file can be dividad into coded segments for inclusion in another file. This lats you prepare a fila with various forms of boilerplete text and then includa extracts from it in a longer lettar. For axample, you could give tha following commend:

```
\IF $CONTRIB"99.99",B3
```

This would tell PeochText to include section B3 of the boilerplete document in this perticuler portion of the letter—but only for those bigwigs who gave more than $100 tha last tima around. Cheapskates might gat a latter that included section B4—which could tell them to cough it up or lose their friends down et Clty Hell.

Similarly, it would ba possibla to sand e specielized letter to those contributors who havan't come up with cash in over a year. And the receivebla department might find it fun to send progressivaly nastiar notas each month to thosa slow-payers and daadbeats.

It's elso possible to enter informetion from the keyboard et print time. For exemple, you could use tha \GET command in conjunction with e couple of others to ask the user for today's data (onca) and than the name, eddress, end salutation for eech of a dozen lettars.

PeochText offars so many options along these lines that it's impossible even to touch on them ell. The menual even gives instructions thet guide the expert in the use of a backward-feeding printer to produce double-column text—though it doesn't look easy. The menual elso expleins how to use dete files to print envalopes and three-across mailing labels. If these kinds of things ere important to you, PeochText may well be the program you've been looking for.

Other Print Options

The only wey you can preview how your text is going to look on peper is to invoka SCREENON from the Print Screen. This prints tha taxt to tha screan with lina numbars at the left edge, and shows correct pege end line breeks, underlining, and (on monochroma displays) boldface. Subscripts and superscripts are displayed with angle brackats, end in certain modes, column formats will be slightly awry.

This is handy for checking your copy before making a final printout. Unfortunately, switching back and forth between the print end edit modas can take a long time even whan PeachText is running from a disk emulator, because the print formattar hes to procass your text each time. When you discover that your heading commend isn't working or your paragraphs are breaking in an unplaasant way, you hava to exit the print mode, entar the edit moda, and locate the problem before you cen meke e correction. The back-end-forthing can bagin to seem interminable.

Print spooling (simultaneous printing while aditing) is aiso availiable. This requires printing the file to disk from tha Print Screen, then returning to the Edit Screen and invoking the Spool Print option.

WITHOUT hesitation, I'd have to call the manual the best I've seen.

Strangaly, I cen't find any easy way to link multiple files—chepters in a book, say—et print tima. To print them out all at once, you apparently have to combine them in the editing process. Considering thet linking filas et print time is a standard option with most other word-processing programs, I find it e major omission. It's indicetive of the PeachText orientetion toward letters, short reports, and an offica anvironment.

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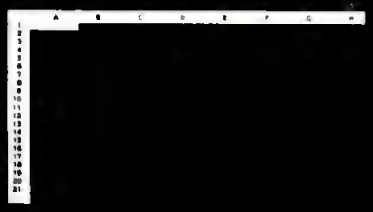

INTERACTIVE ELECTRONIC WORKSHEET	YES	ON-LINE REFERENCE GUIDE	NO	"NAMING" OF CELLS OR AREAS	NO
PLAIN ENGLISH PROMPTS	NO	INDIVIDUAL COLUMN WIDTHS	NO	EXTENSIVE FORMATTING CAPABILITIES	NO
PROTECTED CELLS	NO	MULTIPLE, LINKED WORKSHEETS	NO	SORTING CAPABILITY	NO

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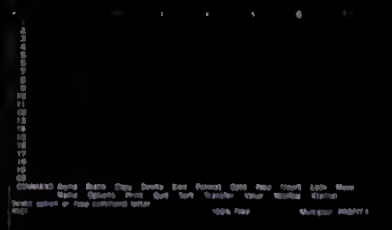
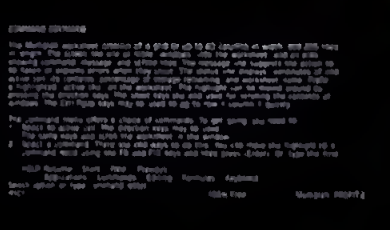


INTERACTIVE ELECTRONIC WORKSHEET **YES**



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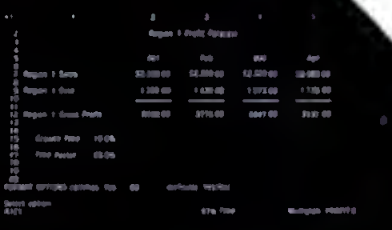

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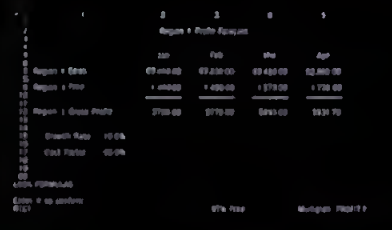
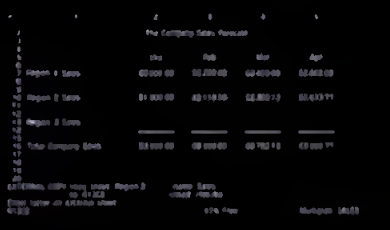


PROTECTED CELLS **YES**



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Documentation

One more indication of this orientation is the manual. Without hesitation, I'd have to call it the best I've seen. In the familiar IBM format, it features a comprehensive index, as well as a complete list of error messages, a quick reference card, and a thick reference section that should solve most potential problems.

The manual uses a tutorial approach to get you up and running. *PeachText* provides a bunch of useful sample files on disk, and the documentation tells you with remarkable precision how to play with and learn from these files. The manual gives you samples of the screen display (in green) and indicates (in gray) the text that you are to manipulate. Because *PeachText* has kept commands to a minimum, it's easy to learn the basics.

It's fun, too. In the opening lessons, you help Abraham Lincoln revise The Gettysburg Address. His first draft, per *PeachText*, began, "It's great to be in Pennsylvania." You get to help Abe change it.

But the manual does include a number of irritating typographical errors. The worst is on page 4.51, where the instructions for embedding a footing command are given in two different ways—and they're both wrong!

The organization of the reference section could be better, too. The "Delete Right Blanks" and "Delete Left Blanks" entries are easy to find, but if you look up "Delete Sentence," you're told to "See 'Sentence Delete.' " I wouldn't care to hazard a guess why the "Line Width" and "Lines Per Inch" entries come between "Move Printer Backward" and "New Line." The index doesn't always refer you to the proper place for every command. And some of the print formatting commands require combinations. Getting all the information I needed to place a running head on the manuscript of this article wasn't easy.

Printer Problems

There's also insufficient advice about printers. If you're using an IBM dot matrix machine, you can relax. But a printer that doesn't respond to that particular set of codes is going to give strange results until you figure out what to do about them. While I was working with the tutorial, *PeachText* kept sending spurious T and H characters to my IDS Prism printer and gave strange results when I entered the

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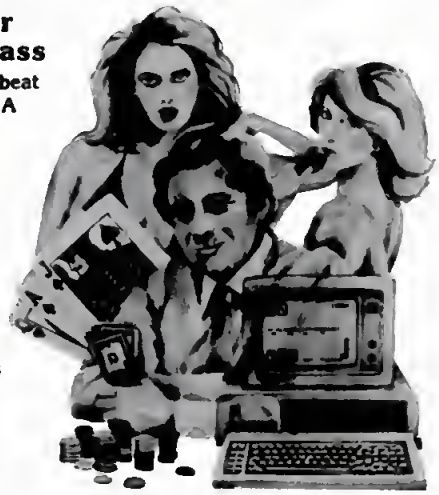

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FORMFEEDOFF command as instructed.

It turned out that I needed to edit a file called PRINT.DFT to tell *PeachText* I wes using what it considers a "Draft" printar. Whare did I find this essential informetion? On the very last pege of the manuel!

Printer support with *PeachText* is a real puzzle. The manual recognizes only three types of printers: the IBM dot metrix, "draft" (other dot metrix), end "specialty" (daisy- end tulip-wheelers thet can do incremantal spacing). Supposedly, *PeachText* will be supplied with a special batch file called PT.BAT thet is customized for a perticuler printer end will install the proper control codes for it. Before huying *PeachTaxt*, insist that the dealer guarantee thet it will work with your printer. Control codes differ markedly among the various letter-quelity printers, and what PT.BAT can do to handle them is totally undocumented in the menual.

BEFORE buying Peachtext, insist that the dealer guarantee that it will work with your printer.

Those with non-IBM dot metrix printers would seem to be out of luck. *PeachText* does not even support superscripting and suhscripting on such printers, and no patch or install program is offered to support special control codes for fancy printing. You can use a print commend called \OUT followed by ASCII numeric codes to send thosa codes to your printer. That should help some, hut you'll heve to embed it in every document that needs the codes.

Odds and Ends

PeachText's error hendling is excellent. I've never been ahle to cause e major problem, iet elone a crash.

PeachText can be used as a program editor, but the manual specifically warns against using it for Microsoft BASIC. The problem involves lines longer than 80 cheracters.

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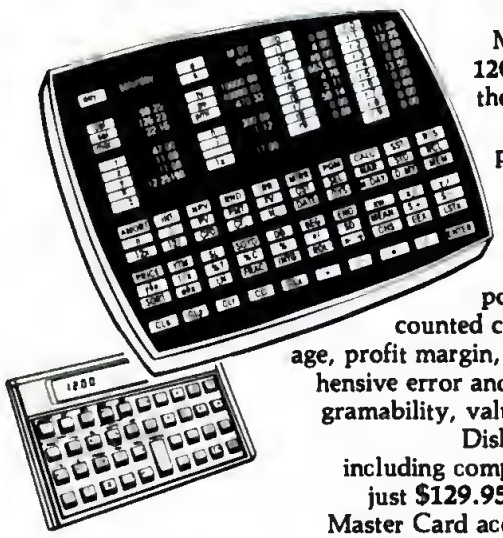

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CIRCLE 506 ON READER SERVICE CARD

Bacause thay don't use control characters, PeochText filas saam to ba pura ASCII. This could maka tham very eesy to communicata with a saven-bit protocol—though you might want to excise all thosa embeddad print commands for peopla who don't use PeochText.

But PeochText lacks a number of faetures available elsewhere. For axample, thare's no decimal tabbing, which lets you align columns quickly and aasily. Column mova capabilities are also lacking. And PeochText will not lat you scroll the screen horizontally past column 80 whila editing. You can print up to column 132 if your printer will allow this, but entry of tabular material could be difficult.

For specializad formats lika movia and telavision scripts, using *PeochText* saams out of tha quastion. Tha repeatad changas of margination raquire an anhancar lika *ProKey* to maka even a screen-oriented program lika *WordStor* parform thasa tasks well. With *PeochText*, tha plathora of formatting commends required makes such tesks unthinkable.

Some paople (I'm not among them) like to work with taxt that is double-spaced on the screen. I can't think of any aasy way to do this with *PeochText*. And with no handy word, lina, or paga count availabla during taxt antry, and no charactar count axcept tha grand totel in memory, you are utterly in the dark when cutting text from the middle of a document in ordar to fit a limitad spaca.

Thara ara many othar things you can't do with *PeochText*. Footnoting saams avan more difficult than with *WordStar*, with which it's far from easy. The method suggastad in tha *PeochText* manual is totally unacceptable, since *PeochText* won't eccapt an undarlining command. The *FinalWord* is tha answar here; its multipla-windowing capability is another valuable itam that *PeochText* lacks. You can't run a program from *PeochText*, aither. To do that, you have to exit the program entirely and anter DOS.

PeochText isn't for me, but it may be for you, aspecially if you do a lot of form lattars, or you naed a powarful word procassor that's reasonably aasy to learn. One favor, please: if you buy *PeochText* to help you with your junk meil, pleasa don't address any of it to ma. */PC*

Stephen Mones is o contributing editor for PC.

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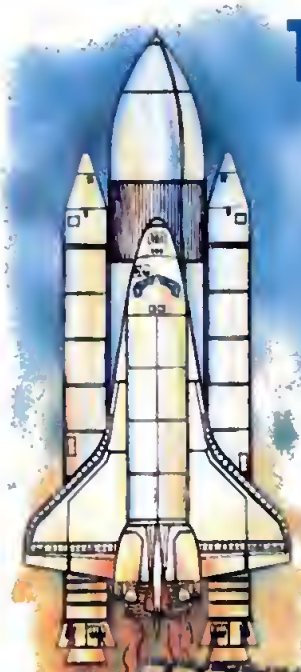

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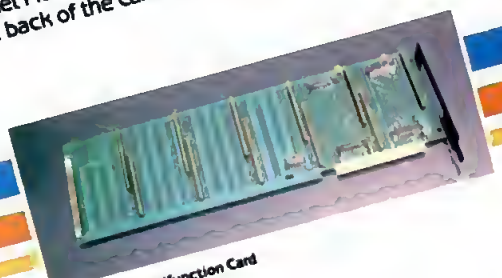

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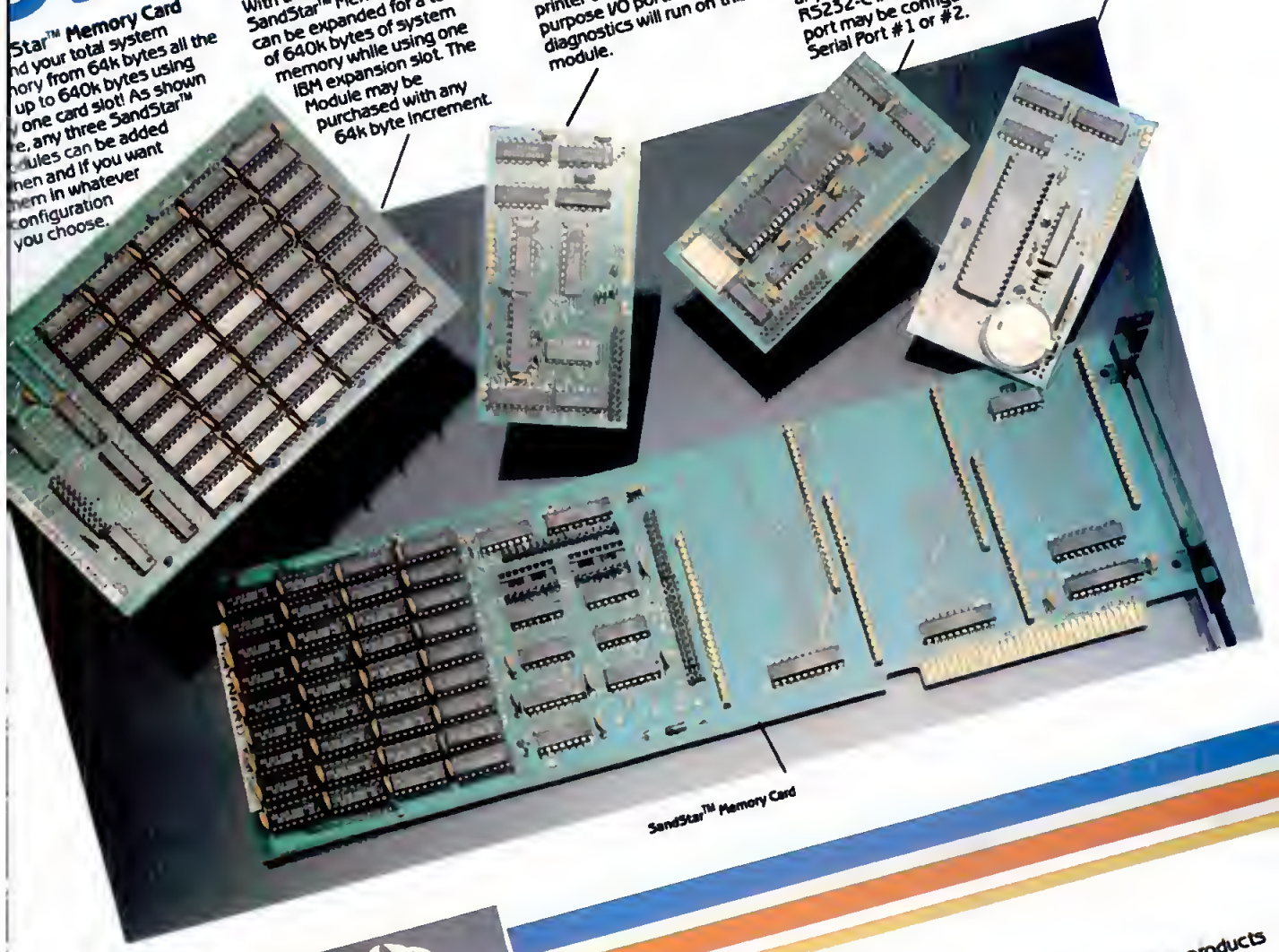

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The flexibility of the PC program set allows you to reassign ASCII codes to display and print characters upsidedown and backwards.

Exercising ASCII

Are you bored with the ordinary appearance of your text? Do you yearn for something completely different? How about a program that prints everything you write upside down or backwards? Don't turn the page just yet; there is a reason for trying such a program, for it will provide you with a glimpse into some of the more arcana workings of your PC.

There are certain principles you'll need to understand before you begin. With the color/graphics card installed, BASIC will work in two different modes, text and graphics. There is one version of text BASIC and two of graphics (medium resolution and high resolution). When you start up BASIC from DOS, you are automatically put into the text mode. To go into the color/graphics mode, you use the Screen 1 (for medium resolution) or Screen 2 (for high resolution) commands. You can return to the text mode at any time by using the Screen 0 command. When in the text mode, a fully defined set of 256 characters is available from ROM. This character set is similar to the one used by the color graphics card, but there are important differences. The color graphics mode allows the programmer to create custom characters that replace part of the normal graphics character set.

Standard Codes in Text Mode

The PC character set includes the standard characters found in most microcomputers. Each character is assigned a unique number so that the computer can identify digits, upper and lower case letters, and punctuation. Because this character set is standard, communication between computers and printers and other hardware is possible. The character code numbers form the American Standard Code for Information Interchange (ASCII); they extend from 0 to 127. For example, the character A is represented by ASCII code 65 on the Apple, the TRS-80, the Atari, and virtually every micro on the market.

But in the text mode above ASCII code 127, there are special character sets that vary in design and purpose from manufacturer to manufacturer. The IBM PC has assigned the code numbers from 128 to

Exercising ASCII

255 to a variety of useful characters, including graphic-grid fragments, scientific notation symbols, foreign language characters, and foreign currency symbols. In the text mode, you can display any of these characters by using the Print command and the CHR$ function. To display the Japanese Yen character, for example, simply type in and enter Print CHR$(157). For the upper left-hand corner of a box, use PRINT CHR$(218), or for a doublelioe box, PRINT CHR$(201).

The number inside the pareotheses is, of course, the ASCII code for the character. Change the number to 65, and the letter A will be displayed. By using the CHR$ functioo, it is possible to priot foreign languages and mathematical formulas, and construct boxes, grids, and even more complex shapes. All 256 characters are displayed on the screen in a two-dimensional grid of dots. The dot arrangements are contained in the PC ROM character generator.

Picture Elements in Graphics Mode

When you use the Screen 1 or Screen 2 command to enter the medium or high resolution graphics modes, something different happens. The screen becomes simply a field of dots, called pixels or pels (picture elements), measuring 320 by 200 in medium resolution or 640 by 200 in high. By turning individual pels on or off we can create complex graphic images. Sioce we no longer have a rigid 80 by 25 screen designed to hold text characters only, the display of text is handled in a differeot, more flexible way.

Standard ASCII characters are "painted" ooto the graphics screen. The grid in which the characters are created still measures 8 by 8, but the information used to display the letters doesn't come from the text ROM chip. Instead, it is in another part of the ROM area called the BIOS section. This information consists of a loog table of bytes. (For more information, see the *IBM Technical Reference Manual*, pages A-75 to A-76.)

Each letter is defioed by one group of eight bytes. In Figure 1, you can see how these eight bytes can form the letter F.

If your thirst for technology is combined with an interest in the IBM Personal

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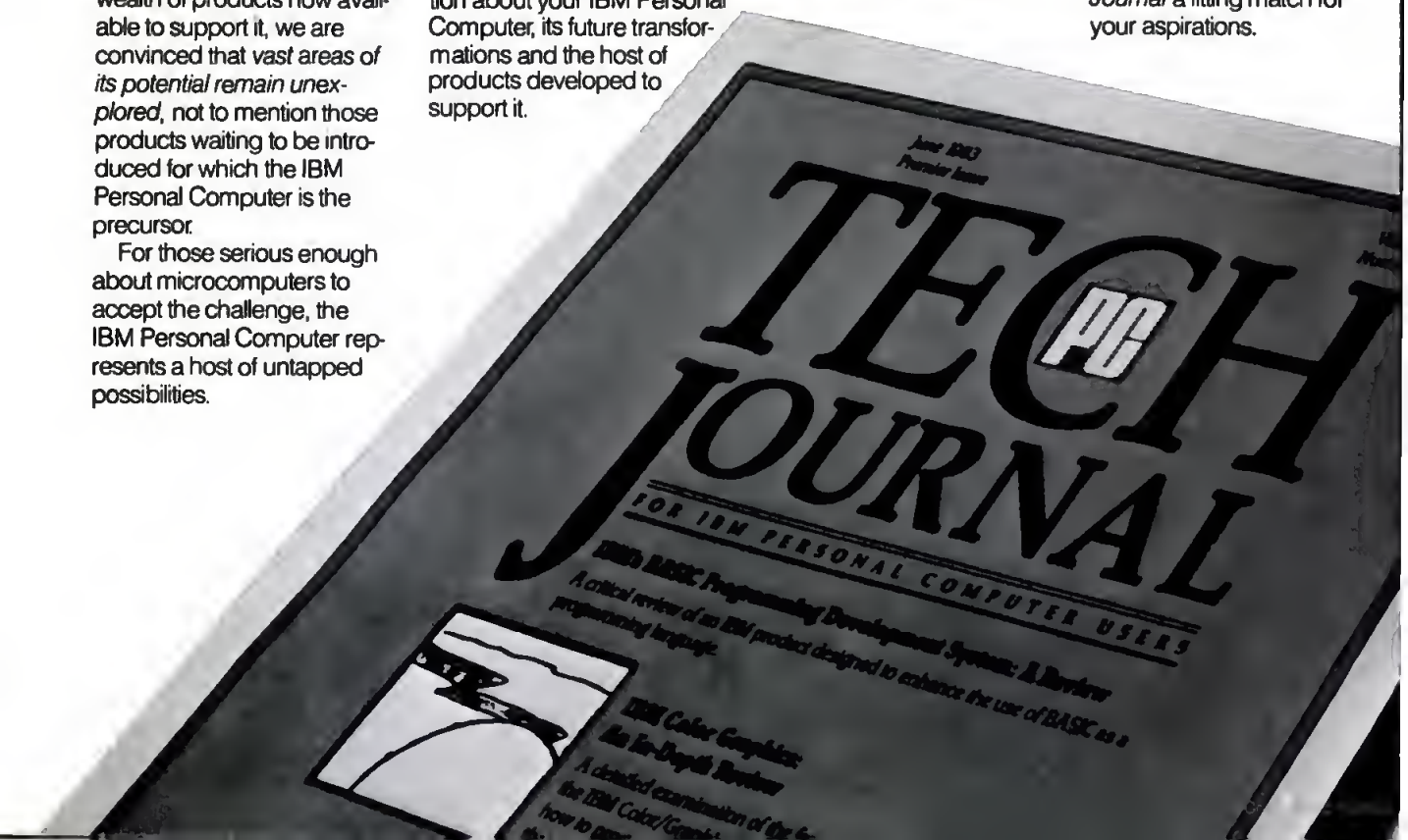

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When e 1 eppears at e given position in the 8 by 8 grid, the corresponding pel is turned on. All of the stendard characters from ASCII 0 to ASCII 127 are encoded end generated in this way.

What happens when you try to display cherecters ebove ASCII 127 in the graphics mode? If you use the Print CHR$(157) in en ettempt to display the Yen sign, nothing eppeers on the screen. Those charectars simply don't exist in the BIOS table. In fect, IBM has reserved tha characters from 128 to 255 for user definition, so that you and I can create characters from our own byte teble. But how do we create a naw tebla and then let BASIC know that it is availabla?

To create a hyta table you hava to design eech individual new character in its own 8 by 8 grid. Tha convantional way to do this is to plot tha position of each pel on greph peper, then somehow put the charactars into memory. To make it simpla to use the set more than once, it is hest to store the new cheracter patterns in a binary dete file. The lebor involved in creeting a new character set this way is considerable, and there are several commercial programs that make tha dasign of charectar sets easy hy letting you drew the letters on a large grid on-screen, then automaticelly stora the results in e file. In the accompanying examplas, tha PC will create two new charactar sets for you end hendle ell the dirty work.

STANDARD ASCII characters are "painted" onto the graphics screen.

Printing Backwards and Upside Down

The first set we creete will be a copy of ell the standard charecters, modified to display characters backwards on tha screen. Tha sacond set will display charecters upside down. Progrem 1 will generete tha two character sets using the byte tahle information from the BIOS area, then store them in two hinary files. Program 2 will load the tahles from tha hinary files and displey both sets in sequence, below the originel character set. The final progrem will demonstrate how the character sets cen be loadad in and used with a BASIC program.

Let's look at how tha programs work. Program 1 creetes the two charecter sets. Lina 150 protects a segment of memory whara wa can store the naw character sets. Line 170 givas the start and end addresses of tha ASCII teble. Linas 180–290 are loops that do two things: LOOP1 loeds in eech byte from tha tahla loceted high up in segment &HF000. LOOP2 exchanges bits ona and eight, two end sevan, three and six, end four and five, as shown in Figure 2. Finally, LOOP1 stores tha reversad hyte in the new teble.

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CIRCLE 504 ON READER SERVICE CARD

After the Reverse teble hes been creeted (see Figure 2), line 310 saves it in a binary file with the BSAVE command. In lines 360–460, we create the Upside-Down set using similar loops. For each letter, there is e teble entry of eight bytes. To turn the letter upside down, we exchange bytes one end eight, two end seven, three end six, end four and five, as shown in Figure 3. This teble is also saved as e separate binery file. Lines 260 end 440 put an animeted cheracter on the screen to reessure the user thet something is heppening while the tables are being creeted. The entire process takes several minutes to complete.

Before looking et the programs thet use the new cherecter tebles, there are a few issues thet must be raised ebout BASIC and memory. In the color/grephics mode, BASIC looks for e user-creeted table whenever it sees en ASCII code ebove 127. To know where to look, our program must provide the address where our teble starts. First, we tell BASIC thet we ere working in Segment 0 of memory with the command DEF SEG-0. Then we can consult the *Technicol Reference Monuol*, which reveals on page 321 thet BASIC will look at eddresses &H007C–&H007F to find out where our table is stored.

Specific information must be put into eech of four bytes. The first two bytes must contein the address of our table, which is &HC000 broken into two parts, &HC0 and &H00:

address &H007D — contents &HC0 = first byte of address
eddress &H007C — contents &H00 = second byte of address

The second two bytes must contain the address of the stert of BASIC. We cen copy thet directly from another part of memory:

address &H007F — copy from the contents of address &H0511
address &H007E — copy from the contents of address &H0510

Once these pointers are set up, we reset the progrem to the normel BASIC segment with the commend DEF SEG. Now, eech time we use e character with ASCII code 128–255, BASIC will look up the correct customized character in the table.

Program 2 takes the sets we heve creeted and displays them on-screen (see Figure 4). Lines 150–190 loop to show the

Figure 1: Chorocter grid in grophics mode for stondord character set.

hexcode	binary code	character grid
&H62	01100010	
&H68	01101000	
&H78	01111000	
&H68	01101000	
&H60	01100000	
&HF0	11110000	
&H00	00000000	

"F" FROM THE GRAPHICS CHARACTER SET

Figure 2: Character grid in graphics made for backwards character set.

hexcode	binary code	character grid
&H7F	01111111	
&H46	01000110	
&H16	00010110	
&H17	00011110	
&H16	00010110	
&H06	00000110	
&H0F	00001111	
&H00	00000000	

"T" FROM THE GENERATED CHARACTERS

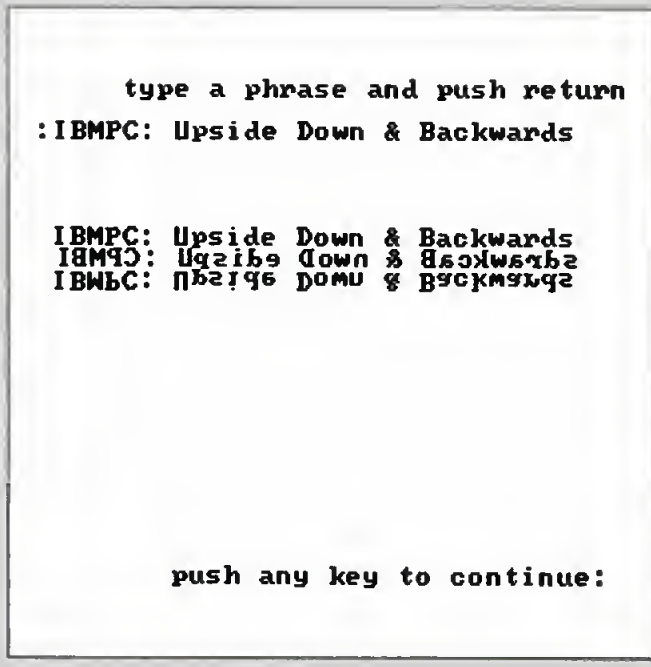
Figure 3: Character grid in graphics made for upside-dawn character set.

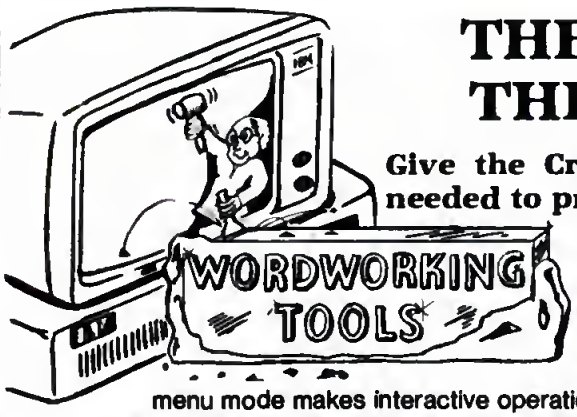
hexcode	binary code	character grid
&H00	00000000	
&HF0	11110000	
&H60	01100000	
&H68	01101000	
&H78	01111000	
&H68	01101000	
&H62	01100010	
&HFE	11111110	

"L" FROM THE GENERATED CHARACTERS

Figure 4: Screen display of standard, backwards, and upside-down character sets from Program 2.

Figure 5: Screen display of Program 3.





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CIRCLE 246 ON READER SERVICE CARD

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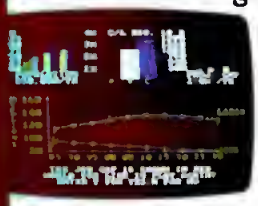

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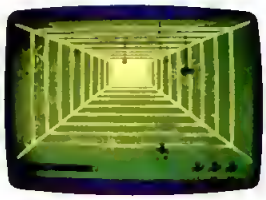

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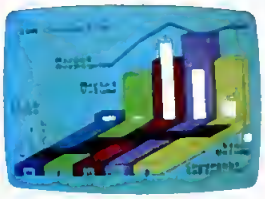

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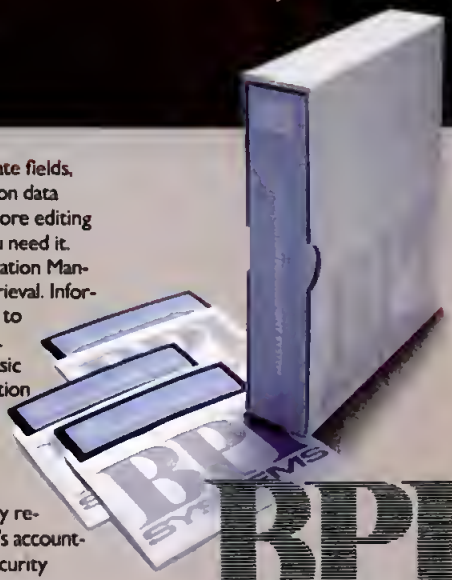

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normal character set. CHR$ does bizarre things when certain ASCII codes are used, so we put dots on the screen to replace those characters. Line 210 protects memory above &HC000. Lines 220–250 tell BASIC where our new character sets can be found. We load the BACKWARD.DAT binary file into memory in line 270 and display it with the loop from line 280 to line 300. Then we load the Upside-Down character set into the same section of memory and display it in lines 320–450.

WHAT HAPPENS when you try to display characters above ASCII 127 in the graphics mode?

Program 3 demonstrates how the character tables can be used by letting you enter a phrase and then see it displayed in the backwards and upside-down alphabet characters (see Figure 5). First, we protect memory in line 140. Then we load both tables into protected memory in line 150, one at &HC000 and the other at &HC400. The pointers are set to look at the start of the table in lines 160–190.

The program then lets you enter a phrase up to 30 characters long. Lines 290–320 redisplay the original text. Lines 330–360 confirm that the Backward table is being pointed to, then loop through to display the message. As the phrase is displayed one character at a time, line 150 of the program adds 128 to the ASCII value of each letter to find its equivalent in the new table. Next, the table pointer is set to the Upside-Down table in Line 370. The loop that follows in lines 380–400 displays the phrase with upside-down characters. Finally, the program loops back to line 210, where a new phrase may be entered or END may be typed to stop the program.

Reminders

There are three important things to remember when creating your own customized character table. First, put the table in a protected area of memory. Second, set up the proper pointers so BASIC can find the new table. Third, store it in a

Character Set Programs

These programs will enable you to create the upside-down and backward character sets illustrated in this article.

Program 1: To create new character sets

```
100 REM MAKESETS.BAS - John Schnell - 1983
110 REM create new character sets
120 SCREEN 1 : KEY OFF : COLOR 1 : CLS
130 LOCATE 10,7,0 : PRINT " CREATING NEW CHARACTER SETS"
140 LOCATE 12,4 : PRINT " this will take about five minutes "
150 CLEAR, &HC000
160 REM create BACKWARD table
170 ASCII.TABLE.START=&HFA6E:ASCII.TABLE.END=&HFE60:REVERSE.SET.PTR=&HC000
180 FOR LOOP1 = ASCII.TABLE.START TO ASCII.TABLE.END
190   DEF SEG = &HF000
200   BYTE    = PEEK(LOOP1)
210   DEF SEG
220   REVERSE.BYTE = 0
230   FOR LOOP2 = 0 TO 7
240     IF BYTE AND 2^LOOP2 THEN REVERSE.BYTE = REVERSE.BYTE + 2^(7-LOOP2)
250   NEXT LOOP2
260   LOCATE 15,19:IF LOOP1 AND 1 THEN PRINT "\0/" ELSE PRINT "/0\"
270   POKE REVERSE.SET.PTR,REVERSE.BYTE
280   REVERSE.SET.PTR = REVERSE.SET.PTR + 1
290 NEXT LOOP1
300 REM save new set to binary file
310 BSAVE "BACKWARD.DAT",&HC000,&H400
320 LOCATE 17,10 : PRINT " new BACKWARD set saved "
330 BEEP
340 REM create UPSIDE-DOWN table
350 UPSIDEDOWN.SET.PTR=&HC000
360 FOR LOOP1 = ASCII.TABLE.START TO ASCII.TABLE.END STEP 8
370   FOR LOOP2 = 0 TO 3
380     DEF SEG = &HF000
390     HIGH.BYTES = PEEK(LOOP1+7-LOOP2)
400     LOW.BYTES  = PEEK(LOOP1+LOOP2)
410     DEF SEG
420     POKE UPSIDEDOWN.SET.PTR+7-LOOP2, LOW.BYTES
430     POKE UPSIDEDOWN.SET.PTR+  LOOP2,HIGH.BYTES
440     LOCATE 15,19 : IF LOOP2 AND 2 THEN PRINT "\0/" ELSE PRINT "/0\"
450   NEXT LOOP2 : UPSIDEDOWN.SET.PTR = UPSIDEDOWN.SET.PTR+8
460 NEXT LOOP1
470 REM save new set to binary file
480 BSAVE "UPSIDOWN.DAT",&HC000,&H400
490 LOCATE 19,8 : PRINT " new UPSIDE-DOWN set saved "
500 BEEP : END
```

Program 2: To display all three character sets

```
100 REM SHOWSETS.BAS - John Schnell - 1983
110 REM display all three character sets
120 SCREEN 1 . KEY OFF : COLOR 1 : CLS
130 REM show the normal character set
140 FOR LOOP1 = 0 TO 127
150   IF LOOP1=7                    THEN PRINT ".";:GOTO 190
160   IF LOOP1>8  AND LOOP1<14 THEN PRINT ".";:GOTO 190
170   IF LOOP1>25 AND LOOP1<32 THEN PRINT ".";:GOTO 190
180 PRINT CHR$(LOOP1);
190 NEXT LOOP1:PRINT:PRINT
200 REM protect memory and set pointers to new character sets
210 DEF SEG : CLEAR, &HC000
220 DEF SEG = 0
230 POKE &H7C,&H0 : POKE&H7D,&HC0
240 POKE &H7E,PEEK(&H510) : POKE &H7F,PEEK(&H511)
250 DEF SEG
260 REM load and show BACKWARD character set
270 BLOAD "BACKWARD.DAT",&HC000
280 FOR LOOP1 = 128 TO 255
290   PRINT CHR$(LOOP1);
300 NEXT LOOP1:PRINT:PRINT
310 REM load and show UPSIDE-DOWN character set
320 BLOAD "UPSIDOWN.DAT",&HC000
330 FOR LOOP1 = 128 TO 255
340   PRINT CHR$(LOOP1);
350 NEXT LOOP1.PRINT:PRINT
360 END
```

Program 3: To demonstrate switching character sets

```
100 REM DEMOSETS.BAS - John Schnell - 1983
110 REM demonstrate switching character sets
120 SCREEN 1 : KEY OFF : COLOR 1 : CLS
130 REM protect memory, set pointers, and load BOTH character sets
140 DEF SEG : CLEAR, &HC000
150 BLOAD "BACKWARD.DAT",&HC000 : BLOAD "UPSIDOWN.DAT",&HC400
160 DEF SEG = 0
170 POKE &H7C,0 : POKE &H7D,C0
180 POKE &H7E,PEEK(&H510):POKE &H7F, PEEK(&H511)
190 DEF SEG
200 REM input user phrase and display NORMAL, BACKWARDS, and UPSIDE-DOWN
210 CLS
220 LOCATE 25,14
230 PRINT "type END to stop";
240 LOCATE 2,6 : PRINT"type a phrase and push return"
250 LOCATE 4,1
260 INPUT;":",PHRASE$
270 IF PHRASE$ = "end" OR PHRASE$ = "END" THEN 460
280 IF LEN(PHRASE$) > 30 THEN BEEP : CLS : LOCATE 1,10 :
    PRINT "too long, try again" : GOTO 220
290 LOCATE 9,1:PRINT " ";
300 FOR LOOP1 = 1 TO LEN(PHRASE$)
310   PRINT CHR$(ASC(MID$(PHRASE$,LOOP1,1)));
320 NEXT LOOP1:PRINT:PRINT " ";
330 DEF SEG =0:POKE &H7D,&HC0:DEF SEG
340 FOR LOOP1 = 1 TO LEN(PHRASE$)
350   PRINT CHR$(ASC(MID$(PHRASE$,LOOP1,1))+128);
360 NEXT LOOP1:PRINT:PRINT " ";
370 DEF SEG =0:POKE &H7D,&HC4:DEG SEG
380 FOR LOOP1 = 1 TO LEN(PHRASE$)
390   PRINT CHR$(ASC(MID$(PHRASE$,LOOP1,1))+128);
400 NEXT LOOP1
410 LOCATE 25,9 : PRINT "push any key to continue:";
420 PAUSE$=INPUT$(1)
430 GOTO 210
440 NEXT LOOP1
450 END
```

binary file so it can be reloaded easily. You can load many tables into protectad memory at the sama tima and usa aach of them with a simple change of the pointer at location &H007E.

You may want to change the programs illustrated here to create your own character sets. It wouldn't be difficult, for instance, to devise a revarsa video sat of the standard characters, or an italic set, or one that simply put odd curves and shapes on the screan as a sort of graphics shape alphabet. If you did craata such a shape alphabat, you could actually enter patterns and designs on-screen from the keyboard.

Even if you don't feel the need to experiment, you might find some purposes for the programs demonstrated here. You could use them as an attention-getting device to point out errors, or for an opening title screen. You can create the impression that your letters are standing on a mirror, for instance. And all such unusual charactar screens can be captured and printed by using a printer screen dump program. */PC*

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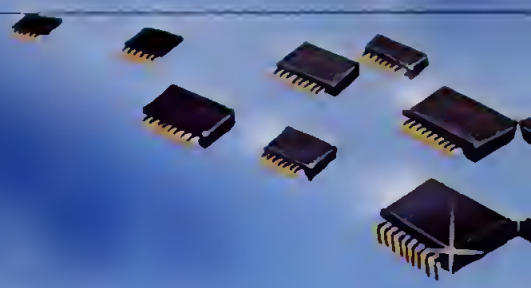
MEMORY/LOUIS WARNER

For most PC users, stuffing RAM chips is a routine, problem-free procedure. If, however, you want to err on the side of extreme caution, here are a few tips.



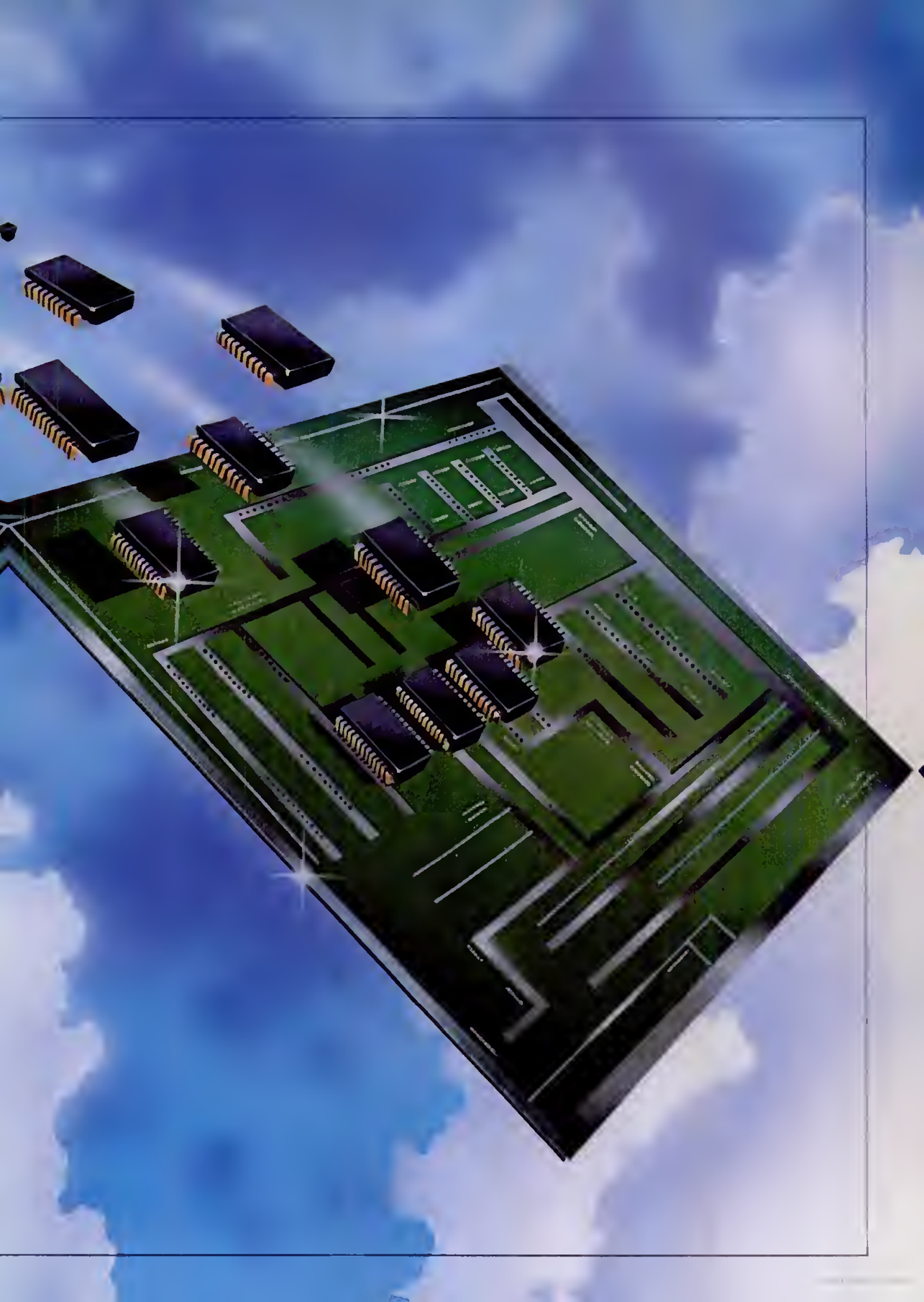
MASTERING MEMORY CHIPS

Feeding your PC an additional load of little black centipeda-lika memory chips may be the most important thing you can do to enhance your computer's capabilities. Although the basic PC unit is equipped with at least 64K, many applications packages will not run on fewer than 128K or even 256K. Devices such as software spoolers and alectronic "RAM disks" can use all tha chips you can cram inside—up to 640K.

If the thought of installing those delicate little electronic flakas makas you nervous, relax. You'ra meraly experiencing the "I'va never done this sort of thing befora" sweat, the sama condition your father probably experienced tha first tima he set out to replace a bad vacuum tube in tha family Philco. Actually, the procedure is fairly simple if you exercise caution and keap a few important facts in mind.

Fresh Chips

First of all, buy your chips from a reputable source. Many memory board manufacturers sall chips they certify as proper for thair boards; others list specifications for purchase from outsida sourcas. Many of the chips are date-coded. You might find that fresher chips hava been subjected to less handling and are less likaly to have been damaged in the process.



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Meke certein the chips you do buy are properly packaged.

The first preceution before you begin stuffing RAM into your memory board is: "Not so fast!" Don't unpeck those chips yet! Memory chips ere very easily demeged by stetic electricity. Stetic electricity lurks everywhere, end I'm not telking about mejor sneps, creckles, end pops—just a silent zop that can send e good chip to the screp heep. Before you insert thet first chip, you must take severel precautions to reduce the amount of stetic in the air.

First, remember thet static electricity hetes humidity but loves nylon and synthetics. if you or anyone else in the room is wearing nylon clothing, including underwear, you're going to heve to strip—or at leest chenge into e neturel cotton fabric. Remove slippers or shoes with synthetic soles; their sliding action generates static. Keep e kettle of water boiling to raise the humidity level slightly, and use a spray bottle filled with weter to lightly mist you, your clothing, the floor, and the chair seet (especielly if it's plestic). Work in an uncluttered room or in e room without cerpeting. And finelly, don't forget to reed over your owner's menual and other Instruction books to be sure you understand the steps required for your particular system board or expansion card.

Setting Up the Operating Room

Before you begin surgery, make sure you have e large sheet of aluminum foil, a vecuum cleaner, e fleshlight, some light hobby tools, e megnifier, and a ped and pencil. After you've gotten your equipment together, unplug the power cable and remove connecting cables from the PC. Next, remove the cover. There are two screws et the lower edge of the beck panel (if necessary, consult your PC owner's manual for a diagram). Slide the cover forward and lift it up siightly to remove. Gently vecuum the fen and the inlet areas in the interior of the computer, being careful not to stir up any dust in the room. If you wish, you can elso wipe the fen bledes with e small brush.

Remove the rear hold-down screw from the expansion board end gently remove the board from the bus socket. You should pull the card straight up, taking care not to damege the gold-pleted connections. Place the piece of aluminum foil flet on the table end touch it occasionally while you work on the chips to avoid getting a shock. If you have a battery-powered device on the board, such as a clock, remove the bettery. Now you're ready to begin.

Inserting the Chips

Place the expansion board on the aluminum foil. Unwrap your chips and place them pins down on the foil. Locate the

MEMORY chips are very easily damaged by static electricity.

lndentation, notch, or other marking on one end of the chip top; this denotes the number one pin end of the chip. To determine on which end of the socket the chip should be inserted, look et the other chips on the board or reed the instructions that accompany your board. Note thet some boards have covers over the unused sockets end thet these must be removed carefully.

Most likely, the pins on the underside of the chips teper outward slightly. Squeeze the pins together gently until they become parallel. Or you can press the sides of the pins gently ageinst the table to bring each row into line. Then carefully set the chip onto the socket in the correct direction. Inspect the chip and socket with your megnifying glass to see that the pins line up properly with the contect holes. If they do, use your thumbs to gently but firmly press the chip into the socket. (Special chip insertion and removel tools can aiso be used.)

Using the megnifier, inspect the chip to see that all of the pins have been grabbed by the socket and thet none have been folded under. Repeet the process for the other eight chips in each 64K bank. (The PC uses eight chips for memory and one for parity check for eech 64K of RAM.)

The Moment of Truth

When you've finished stuffing one set of 64K, stop and run e test to make sure your PC is running properly. If you heve

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made an error or if you have purchased a defective chip, it's better to discover the problem now rather than after all the chips have been installed. Begin the test by rasetting the switches on the PC motherboard to account for the memory you've just added. (Consult the PC manual or the manual that came with your memory board for the proper setting and procedure.) Next, plug in the powar card and install the nacessary operating cables. Now, tha moment of truth—install tha DOS disk in the A drive and turn on the power. If you don't hear that reassuring beap right away, don't panic. Tha PC goas through a routine of salf-diagnostic tasts before it begins its work. For axampla, if you've installed a set of 256K RAM chips, it could take a full minuta befora tha allclaar is soundad. On the other hand, if you don't hear tha beep at all, or if the sequence of beeps and disk grinds differs from what you axpect to haar (consult your usar's manual again), you may hava a problam. Writa down any error massage that appaars on tha screen. If your memory expansion card contains little "parity lights," note their condition, than shut off the powar.

Frequent Flubs

If you've followed each step of the installation procedure to the letter, but your PC rafuses to run proparly, don't be discouraged. What went wrong? Well, parhaps the switches on the system board ware sat improperly. Have you accounted for all of your PC memory, including tha system board, other expansion boards, a CP/M adapter with mamory, or other devicas? Check your arithmetic, then recheck your switch settings. There are two sets of switches, and there are laft-to-right and up-and-down positions to consider.

When swapping chips, don't overdo it! Memory board sockets are not designed for wear and tear.

Have you installed the memory board properly? Check the contacts to make sure they are correctly aligned with the PC expansion slot. Also, chack tha cables to make sure you've installed them proparly. Perhaps you've disturbed an internal cable on the PC; ona of the ribbon cables from the disk adapter, for exampla.

You might have a defective memory expansion board. Check for cracks or breaks in tha printad circuit or soldar joints. You hava plugged the computar in, haven't you?

Testing Chips

If you have invastigatad all the possibilities, but you still can't discovar the problam, perhaps ona of your chips is defective. If you have spare chips on hand, try switching a faw at a time into the new bank of chips. If tha circuit passes tha test, you can assuma that ona of the chips you've removad is faulty. To isolate tha faulty one, insert the suspect chips one at a time until the RAM circuit fails again.

If you don't hava any extra chips, insert two or three of the new chips at a tima into a working RAM circuit until you isolata tha bad chip. Ba sure to changa the switch settings beforehand if you're reducing the number of chips in your isolation testing. Also kaap in mind that soma mamory boards hava the first bank of 64K soldered firmly into place. And remember: when swapping chips, don't overdo it! Memory board sockets are not dasigned for wear and tear.

Burning In the Circuit

It's possible that you might finish tha testing procedura without finding a bad chip. Assuming you've installad tha chips and tha memory board properly and you've sat tha computer switches correctly, tha problem may ba a transitory one—a glitch that shows up only undar certain conditions or only momentarily. If the computar seems to be working, leava tha power on for several hours or longar; manufacturers call this "burning in" a circuit. If the problem returns, try the isolation procedure again. But remamber, if it's not broken don't fix it!

Happy stuffing. */PC*

Louis A. Wornar is on engineer in Woodbridge, Connecticut.

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EDUCATION/RICHARD A. WALKER & DANN BERGMANN

Experts predict a $1 billion market for educational software by 1987. Programmers must become students, though, before they can teach computers to teach.

The Blossoming Of Computer Aided Instruction

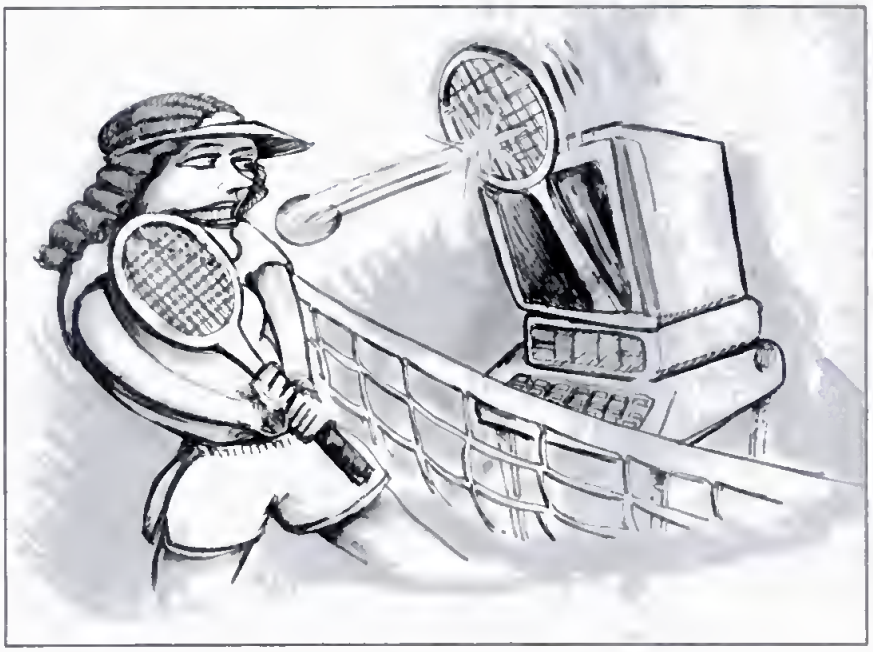
During the 1960s, parents who sat with their children et kitchen tebles across the nation puzzling over the "new math" were collectively bewildered by the strange, spare notations of number systems and set theory. They may have been dismayed by their inability to decipher e ten-year-old's homework. But that was only tha beginning. When it comas to computers, it seems that it's never too aarly to introduca a child. For, unlike their parents, children ere often more curious than apprahensiva.

Today, tha use of computers in schools is increasing at en impressive rate. Children may go from meth clesses to BASIC classes whare, es often es not, the computer itself, in tendem with eppropriete software, acts as the teacher. Not only are students learning about computers on computers, but the PCs are used to improve skills in science, reading, and languaga, to name a faw subject areas.

The educational softwara market is not limited to tha classroom. Chances are that the student who wants to finish his long division assignment et home on the family PC will heve to distrect e parent bent over the keyboard learning French or polishing rusty typing skills. For, in addition to baing a tool for word processing, record keeping, end budget menegement, the PC is a natural for computer assisted instruction (CAI).

A Bright Future for CAI

If the numbers are an indication, the CAI market will grow by leaps and bounds over the next 5 years, despite a shortage of quality software todey. In a comprahansiva report on the educationel software market, tha Dallas market research firm of Futura Computing Inc. projects a phenomenal compound annuel growth rate of 71 percent for CAI programs. A $70 million market in 1982, the market will just graze tha billion dollar mark by 1987. The study



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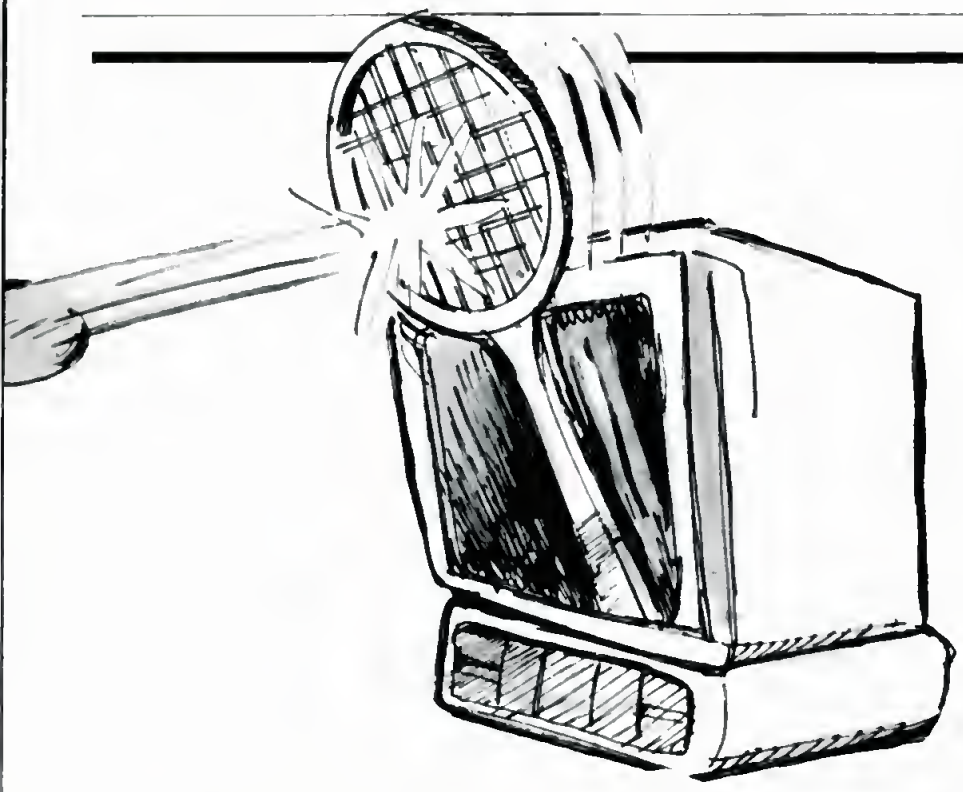

predicts thet during this period, seles of "coursewere," will increase from 2.3 million units to en astounding 34 million units. In the coming months the renks of courseware developers ere likely to swell.

Monitoring the Trend

According to e recent study by A. R. Molnar, a researcher who compiled the results of 59 independent computer-besed instruction studies, computer eided instruction produced significently better results then conventionel methods of instruction. A typical student participeting in a computer-besed course echieved scores 10 to 15 percent higher then those echieved by students in treditionel learning environments.

IN THE coming months the ranks of courseware developers are likely to swell.

The results were the seme for students et ell levels of proficiency. Molnar also determined thet computer eided instruction inspired greater interest among students in their courses, en ebsolute prerequisite to improved learning results. Moreover, CAI students learned the course material in two-thirds the time that it took students who relied strictly on conventional methods. CAI wes fester, resulted in higher scores, and wes better received then treditionel classroom instruction.

Innovative Uses

The computer's ebility to mimic reel life suggests countless uses for CAI. Designers of eirline pilot treining programs heve long known its edventeges. Using computer-based flight simuletors, fledgling pilots can reproduce convincing flight conditions without ever leaving the ground. The time, expense, and potentiel denger of test flights ere minimized.

A chemistry teecher mey be reluctant to ellow his students to work with voletile chemicels in the lab, feering en explosive reection. A computer can simulate the properties of chemicels end the possible mixtures while the student observes, protected from denger until be understands the principles involved.

Manegement es e science hes become an importent trend in recent yeers, and the computer cen be used effectively in its study. For exemple, e supervisor who is learning manegement techniques may "talk" to e computer thet has been progremmed to pley the role of e disgruntled subordinete. The computer simuletes e dialogue by presenting the problem at hand, offers e series of possible responses or solutions to thet problem, and eveluates eech response. The supervisor learns manegement techniques and theory through this dialogue, without ectuelly tying up e second role player.

WHY ISN'T the computer more effective as an educational tool?

There are other innovetive uses for the computer in treining end educetion. A PC can prepare students for standardized exams such as the SAT or the lew boards. It can teech word processing or speed reeding. In the guise of an arcade-like geme it can present the principles of reasoning and organization. With so many possibilities, why isn't the computer more effective es an educationel tool?

Courseware Does the Teaching

The computer is an extremely capeble delivery device, but by itself that's ell it is. The sine quo non of CAI is softwere—or courseware—which drives the computer end does the teeching. Today, the shortege of acceptable courseware hinders the effectiveness of computer eided instruction.

It has been estimated that about 5 percent of ell software written for personal computers is courseware. However, many industry experts believe that only a fraction of that courseware is effective. Tbe quelity of the courseware thet is aveileble now renges from soporific to exciting progrems thet use the computer creetively.

A Cottage Industry

Courseware development is lergely e cottege industry mede up of mom and pop operetions. No single software manufacturer dominates the market.

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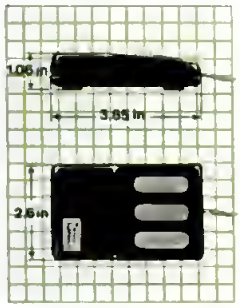

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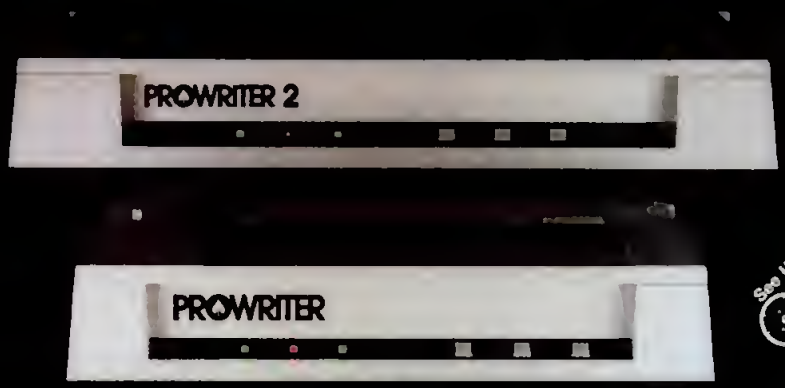

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CIRCLE 161 ON READER SERVICE CARD

ducer, director, and stage manager. He must plan programs thoughtfully, always keeping the needs of the intended user in mind. And he must pay meticulous attention to detail.

There are two essential guidelines for courseware developers: logic and good sense. The product will fall flat if it is not coherent, efficient, and easy to use. This means that the instructions must be clear and well written. All bugs, glitches, and grammatical errors must be ironed out. Imagine, for example, the confusion that a misplaced decimal point in a mathematical equation could cause.

A well-conceived educational program encourages the student to interact with it. It focuses on the best answer, and offers a pat on the back when the student responds correctly. It never causes the student to question his own ability.

The unique capabilities of the computer can be a creative gold mine for the courseware developer. Whenever appropriate, the program should feature graphics, sound, and special effects (but not at the expense of its objectives). An astute courseware developer could play off the recent video game craze by designing courseware to evoke the challenge, competition, and fantasy of the best of the games. A program that is stimulating and creative makes learning seem effortless.

Perhaps most important, a courseware program must be instructionally sound,

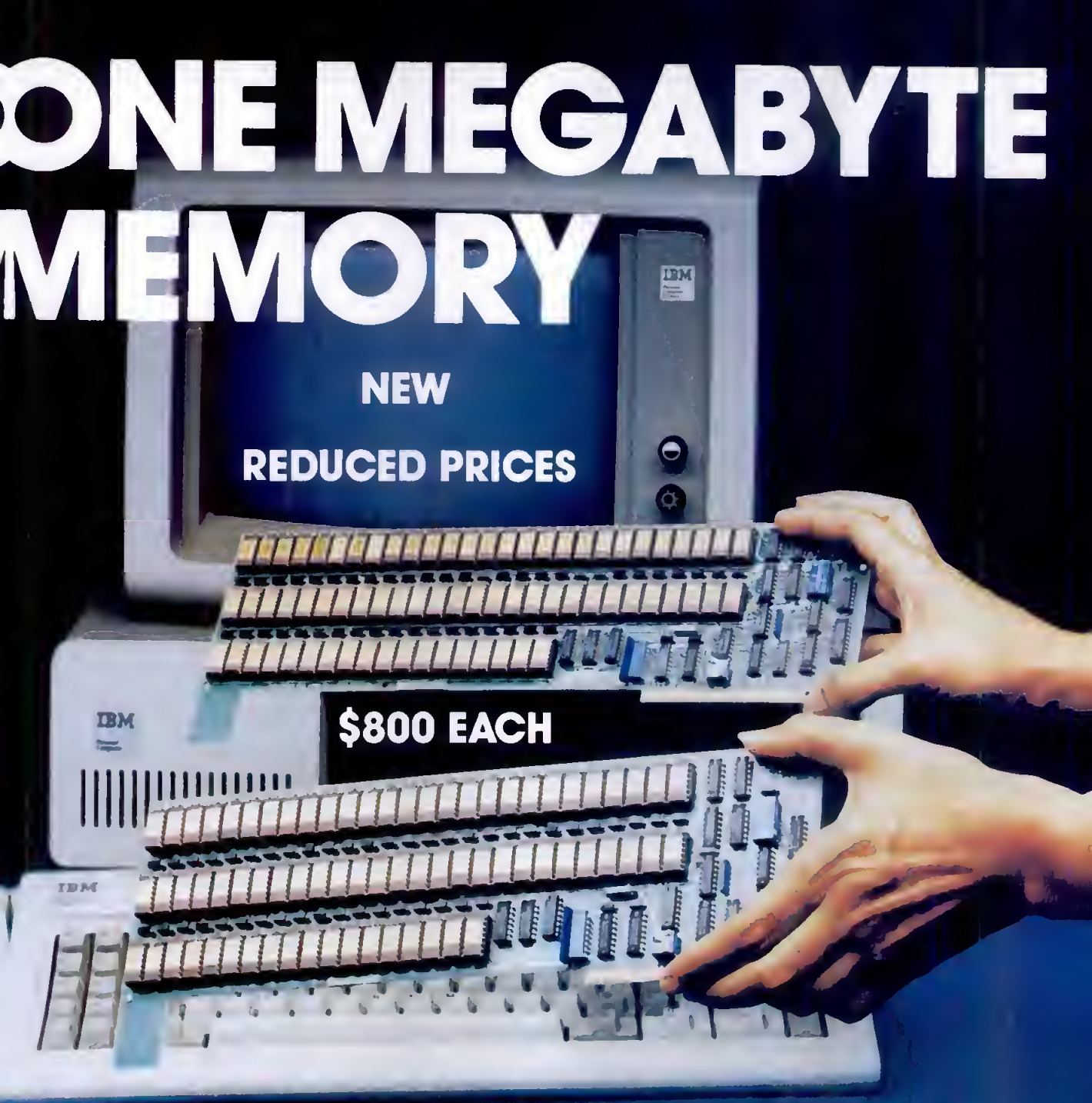
THE SHORTAGE of acceptable courseware hinders the effectiveness of computer aided instruction.

which can be a tall order for a developer who knows little of the principles of education. Basically, it means that the courseware has been produced systematically using a four-step process: analysis, design, development, and evaluation.

Analysis

Before pen is put to paper, the develop-

ONE MEGABYTE MEMORY



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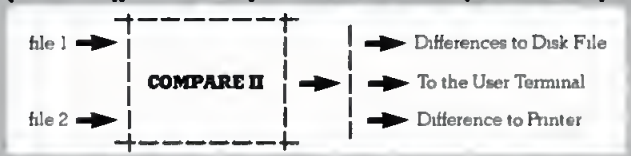

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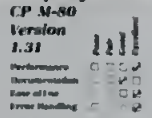

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er must esteblish thet there is a need for the proposed coursewere. He sets goels for the program simply by deciding whet the user should be eble to do after completing the course. The goels then become the building blocks for the program. It ls helpful to stete these goels cleerly in the documentetion that will eccompany the progrem. It is difficult to spend too much time in this eerly enalysis. A hestily conceived program will probably be doomed to sit on e shelf collecting dust.

COURSEWARE development is largely a cottage industry made up of mom and pop operations.

At this time, the developer should identify for both the students end the instructors those prerequisite skills thet are called for by the progrem. Like the progrem goels, these educational prerequisites should be displeyed prominently in the documentation.

Design

Development moves into the design phese, in which the delivery system characteristics will be selected. The designers consider precisely the interection of text, color, grephics, end sound, and they budget resources to best serve the program.

A disk is e unique medium to work with, end the progrem designers must ellocete spece carefully. For exemple, they must decide how many graphics frames to use, given thet graphics require up to 4,000 bytes while text fremes might only require 250.

A team approech works well during design. The team should consist of e subject metter expert (SME), who monitors the content of the progrem; an instructionel designer, who specielizes in learning theory end its epplication to instructional progrems; e system enalyst, to determine the feesibility of developing and implementing the program; and a graphic artist, who sets the visual tone of the program end designs its graphics.

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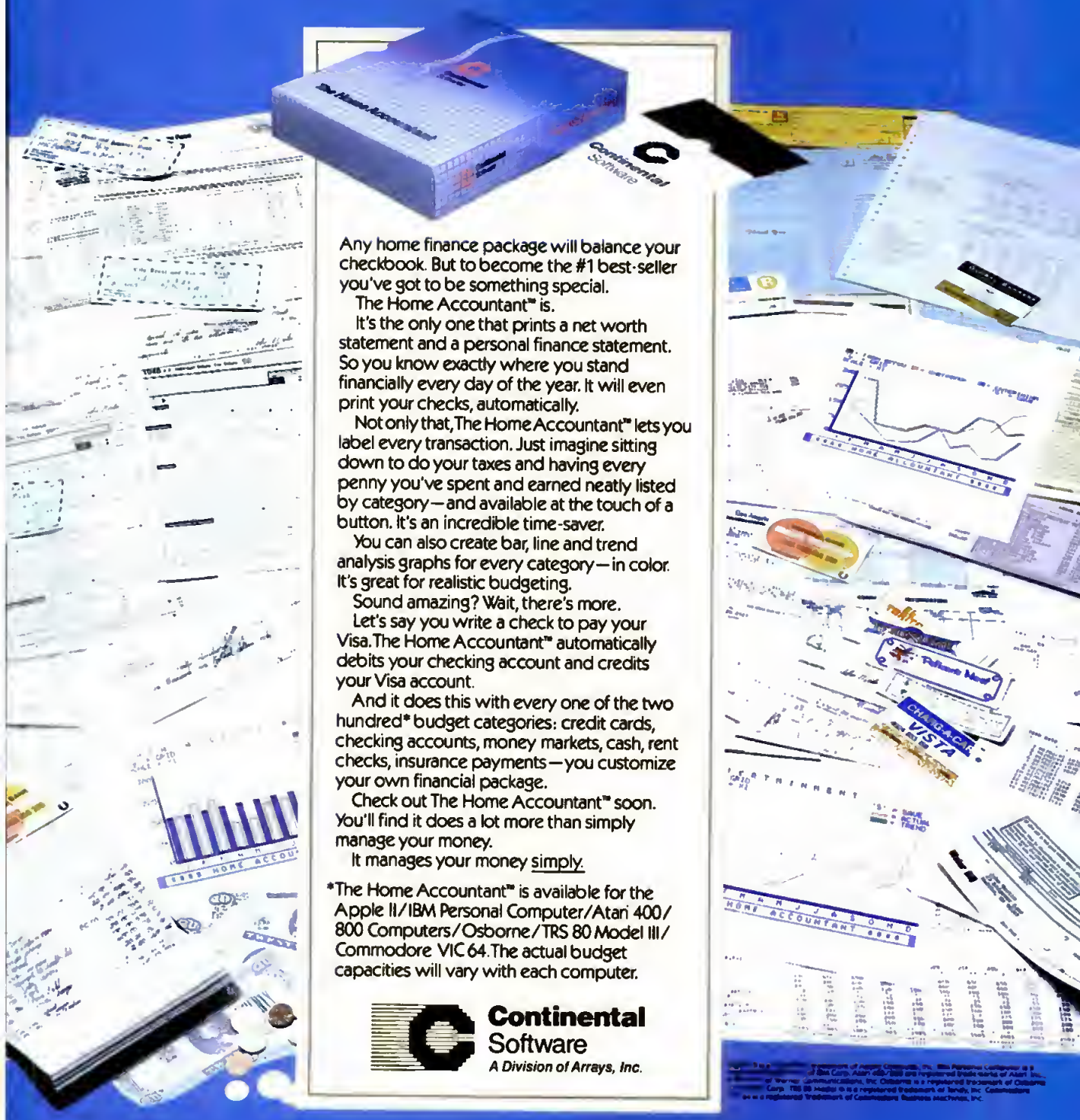

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The course outline takes final shape during the design phase. The outline is essential, as it sets the order that the lessons will follow. It is imperative that the lessons be properly sequenced to build on each other. Poor judgement here can seriously undermine the program. For instance, a student who has not yet grasped

EDUCATIONAL prerequisites should be displayed prominently in the documentation.

the concept of "horrowing" will have difficulty suhtracting four-digit numbers. Courseware thet attempts to teach suhtraction must therefore introduce borrowing early on, or list it as a prerequisite.

Once a sequence has been established, critical content and teaching stretegies are specified. Analyzing critical content determines the concepts e student must master in order to meet eech lesson's objective. This meens, for example, thet if the lesson calls for completion of a 1040 tax form, each step for fiing out the form must be specified. The teaching strategies determine the methods that will be used to present the meterial. A specific strategy might teach students the procedures for printing text thet they have used e word processing program to write or edit. Teaching the distinctions between mammels end reptiles would require a different strategy.

The design team finalizes the number and content of instructional examples and exercises in the program. It also decides how much control to give the learner. The most successful programs ellow the learner to pace himself hy controlling the segment of the instruction he views. He can jump from one lesson to another, from topic to topic, or he can even hypess the exercises entirely if he feels confident ehout the material.

Practice examples and learner control are essential perts of an instructional program. It is not surprising, therefore, that in reviews of educational software the programs that receive the poorest ratings consistently leck these feetures.

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FILE LOCKING system function calls enable single user applications to be easily converted to multi-user.

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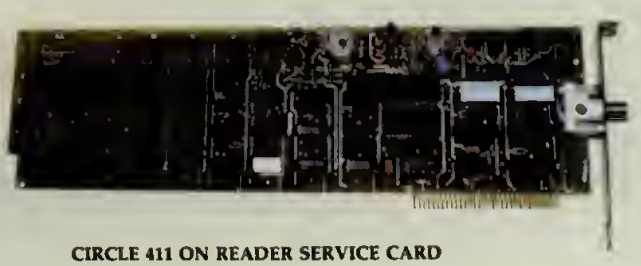

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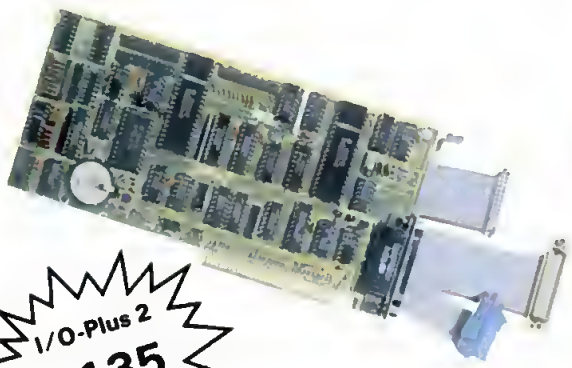

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CIRCLE 384 ON READER SERVICE CARD

Development

The pece quickens during the development phase, which is when the instructionel material actually is written and programmed. Good, effective courseware designers edhere closely to the learning and programming guidelines established in the design phase. They prepare introductory end connecting texts, which include Introductions and objectives for the lessons, a clear and precise statement of the core informetion, and explicit instructions thet lead the student through the lessons. Instructions can be written into the program proper or enclosed as printed metter. Either way, instructions must be es clear and complete es possible.

Evaluation

During the finel eveluetion, the designers test and revise the courseware. They troubleshoot persistent bugs end glitches and identify other errors. The results of eny field testing thet has been done are essessed. Did students do well in the course? If not, how can the program be modified or strengthened?

A courseware development team mey make the mistake of downplaying the need to eveluete its finished product. Weary perhaps of meetings and repeated revisions, the teem members decide to release the program and let it stand on lts own merits. This is imprudent, as e seemingly insignificant change in en instruction or definition, ordered after e final review, can often improve a program significantly.

Practice Makes Perfect

Educational markets are e frontier for the personal computer—and for skilled educationel progremmers. As the price of a PC declines over the next decade, more schools and homes will boast personal computer systems. This rosy future depends on the ability of courseware developers to produce educationel software that is sensitive to the needs of new users, and above ell, instructionally sound. It can only be hoped that prectice will meke perfect for this budding industry. */PC*

Richord Wolker and Dann Bergmonn ore monoger ond ossistont monoger respectively of electronic publishing ot Coursewore Inc. Dr. Wolker's roundup of educotionol software oppeored in PC, Volume 1 Number 8.

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System Requirements

IBM Personal Computer
128K Bytes Memory

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CIRCLE 449 ON READER SERVICE CARD

You may not have to study botany to understand how DOS 2.0 works with IBM's new fixed disk, but it helps to know something about trees.

BRANCHING OUT WITH THE IBM FIXED DISK

Of all the interesting hardware and software that IBM announced in March when it unveiled the new Personal Computer XT, easily the most interesting is the new 10-megabyte hard disk storage system. Hard disk systems for PCs aren't anything new. A glance through the ads in any recent issue of PC Magazine reveals that quite a few different hard disks have been available for the PC, in different prices, sizes, and styles.

Hard disks are the big brother of floppy disks, the very big brother. The idea is the same: a rotating platter coated with magnetic material, data stored in concentric circles called tracks, and so forth. The dimensions, however, are very different. Hard disks use a rigid metal platter rather than a flexible piece of plastic, making it possible to store data at a higher density, which allows a much greater storage capacity. The rigid platter also allows the disk to spin faster, resulting in much quicker access to the data. Depending upon how many disk surfaces are used, and how high the recording density is, the capacity of different hard disk systems for the PC ranges from a low of about 5 megabytes (5,000,000 characters), to a high of about 25 megabytes. The most popular sizes seem to be 5 and 10, and 10 megabytes is the size that IBM chose for its own fixed disk.

Design Limitations

Most hard disk systems make use of a technology that was first code-named "Winchester" when it was a secret new product at IBM, years ago. Winchester technology requires a tightly controlled environment, which means a sealed case enclosing the disks. Because they are sealed, the disks on a Winchester system can't be removed. While a floppy disk drive can access an unlimited amount of data (by changing disks), a Winchester hard disk is restricted to a fixed capacity. Although a hard disk will hold much more than a single floppy disk, you must manage the space on a hard disk system more carefully, since the space limit is intractable.

There are, however, hard disk systems with removable cartridges; these cartridge disks do not implement true Winchester technology, but their speed and capacity is in the same ballpark. Cartridge hard disks offer most of the best of both floppies and Winchesters: high speed, high capacity, and unlimited off-line storage. But IBM's hard disk system is a true Winchester; it is not removable.

You'll notice that different terms—hard disks, Winchester disks, fixed

Illustration: Don Day

disks—are used interchengaebly. Until you bacoma femiliar with datails that distinguish e hard disk from e Winchester, or a Winchester from a fixed disk, these terms refer to the sama thing: high speed, high capacity disk storege. IBM prefers to use the term "fixed disk" for its new PC equipmant.

Fixed vs. Electronic

The IBM 10-megabyte disk holds the equivelent of over 60 singla-sidad floppy disks, or over 30 doubla-sided disks. Chences are, your total library of programs end dete emount to less then this. In rough terms, a hard disk is about five or ten times fester than e conventionel disk. In contrast, using mamory to simulate a floppy disk—whet's called e RAM disk, or electronic disk—is ebout twice as fest as a hard disk systam.

Since electronic disks heva bacome vary popular, its natural to ask if e hard disk obvietes the need for an electronic disk. The enswer is yes, avan though an electronic disk is twice as fast. To understand why, you need to understend the idaa of a bottleneck. If one component of a computer system is very slow compared to the rest of the system, it is the bottleneck that limits the over-all working speed of the computer. If that one part is brought up to e speed comperable to the rest of the system, the bottleneck is elimineted. But if that one part is spad up still further, tha proportionel improvement is small. This is because the system is using its various perts in a belanced proportion; evary part

WINCHESTER technology requires a highly controlled environment.

would heve to be sped up to significantly improve the whole.

In personal computers, including the PC, floppy disks hava ceusad most bottlenecks. Anything thet increeses the speed of disk eccess improves the affectiva speed of the whole computer. Either a hard disk or an elactronic disk will do tha job. Installing both, howevar, will not gain much extra advantaga. If you are using an electronic disk, adding a hard disk will result in about the same speed. If you are buying e hard disk, don't invest in tha extra mamory neaded for an electronic disk; it will probably be a waste of monay.

Inside the IBM Fixed Disk Drive

Tha IBM systam is the same size as tha floppy disk drivas, so it fits into the sema slot. The power needs are quite e bit higher, which explains why you cannot slida IBM's fixed disk into your PC; it has to be put into the expension unit. The new XT, which features e haftier power supply, can hendle e fixed disk inside its reguler casa.

Tha fixed disk casa contains two platters, so there are four recording surfaces. While the standard PC disk hes 40 trecks (or concantric circles of recordad data), tha fixad disk hes 306 tracks with 17 sectors on aach track. Floppy disks have eight sectors (nine sectors optional with DOS 2.0). The sector size remains the sama: 512 bytes. It's interesting thet IBM chose to retain the sector size of the floppies. Inesmuch es tha DOS 2.0 and the herd disk require more memory, IBM could have switched to a larger sector size. Keeping the same sector siza, however, reduces the risk of any software incompatibility.

Doing a littie arithmetic, 512 bytes per sector, 17 sectors per treck, 306 tracks par side, and four sidas to tha disks, yields e rew capacity of 10,653,696 bytes. The opereting systam itself consumas soma of this capacity, but unlika floppy disks, its eppetite veries. Consequently, no exect figura cen be quotad for the workIng capacity of the disk. IBM therefore quotes e conservativa estimete of 10,240,000 bytes, or 10 megabytes in round numbers.

Both tha PC and the PC-XT can accommodete one or two hard disks, tharaby increesing potentiel cepecity to 20 megabytes. On tha originel floppy system, tha drives are known es A, B, C, and D, depending on how meny you hava (up to four). But with the herd disks, the first herd disk is always drive C, evan if you don't have en A or e B floppy disk. Tha first floppy disk is A, and the optional second is B; the first herd disk is C, the optional second is D. The reason for this lias in the problem of booting your system, end some changes to ROM.

More specifically, e hard disk system creetes e smell problem for booting, or sterting up the opereting system. Under most circumstances you'll went to keep your oparating system on tha herd disk, end just boot from it. But to maintein flexibility, and to be able to run stand-alone programs lika the Microsoft Flight Simulotor, you have to eble to boot from the floppy disk as well. IBM solved this problam by making e change to the Read-Only-Memory, or ROM, routines.

THE NEW ROM includes a change in the start-up routine for booting.

In tha PC-XT, the new ROM includes e chenge in the stert-up routine for booting. Tha ROM program trias first to read a start-up (boot) record, from disk driva A. If drive A cannot be read, then the procedure is applied to hard disk drive C. If neither A nor C can be read, the cassette BASIC system goes into ection, just as with the original PC when you boot it up without a disk ready in drive A. This meens thet to boot from the herd disk, you have to meke sure that you don't elreedy heva a disk in tha A drive.

Tha PC-XT comes with tha naw ROM. A hard-disk expension unit for the originel PC includas tha new ROM in an easy-to-instell kit.

Basidas the problem of booting the systam, there is e second, and sneakier, reason why thare is e new ROM for the new disk. While IBM is being vary benevolent to the PC merketplece in general, when it wants the territory to itself, it will go after it with its legendary predetory tactica. By introducing its hard disk with supporting chenges to ROM, end e vary smart, though rather expansive, disk controller board IBM hes made it much more difficult for other hard disk sellers to compete for a share of the PC market. Although the new version of DOS is vary recaptive to the eddition of non-IBM devices, including hard disks, IBM's support of its own hard disk gives it a reel edvantege thet other

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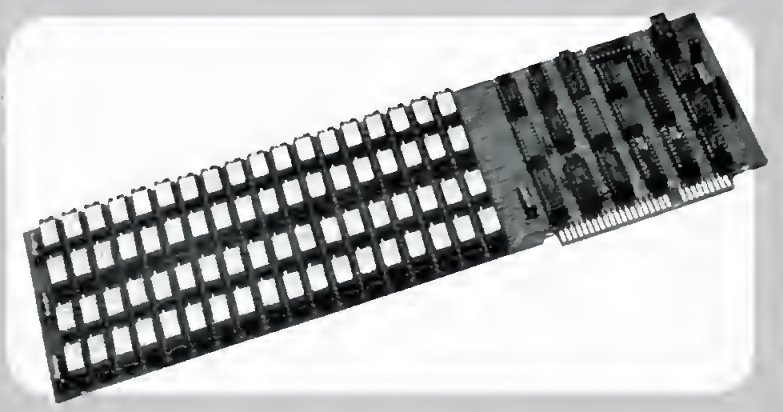

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vendors will have to work hard to match.

Branching Out

So far I've focused on the new disk system, but the fact is that DOS 2.0-based software support for the IBM fixed disk drive is the most interesting part of story. Rather than leaping into the middle of the new DOS disk features, let's sneak up on them by looking at what the problems are with using a hard disk.

Ordinary floppy disks heve been eble to hold up to 64 files for single-sided disks, and 112 files for double-sided. Trying to keep treck of this many files can be a problem. If you ask for e DIR directory listing on a disk with 50 or more files, you'll have a hard time spotting the ones you are looking for. Even with a sorted directory listing, which you can get with the new DOS 2.0 "pipeline filters," it isn't easy to isolate one set of files from enother. Of course, we have alweys been able to code our file nemes to group files by category, but this makes it difficult to give files good, recognizable names.

IBM HAS MADE it more difficult for other hard disk sellers to compete for a share of the PC market.

If this is something of e problem with floppy disks, imagine the problem with a hard disk with 30 times as much capecity. A directory listing of 3,000 files might turn out to be a little inconvenient. So something had to be done to make all those files menageable. IBM's solution was "tree-structured directories."

The basic idea of tree-structured directories is very simple. Normelly e file directory lists only files. With DOS 2.0, the entry in e file directory mey be the name of enother directory. And that directory can have other directories under it. Each directory may contain files, other directories, or both, In eny combination. Eech disk device, herd disk or floppy, requires e master or root directory. This directory may also contain files and subdirectories. Since tbis wbole business can fan out,

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with each directory containing several files and directories spreading out from it, the leyout hes come to be celled e "tree-structure." The files ere the leaves; the subdirectories are the branches.

When you format a fixed or floppy disk, its normel root directory is created eutometically. Subdirectories, however, remein under your control. DOS 2.0 contains commends to create or delete directories. Fencier stuff, such as moving a directory from one plece to enother, isn't provided.

In the old days we got to files (and progrems, which reside in files) by specifying the drive slot such as B:. If the file we wented wes in the current defeult device, then we could leave that part off; and when we wanted, we could change the default device. The seme epproech applies to the new directory trees, with eppropriate twists. Before we look et the details, though, let's consider what we did in the pest in e new light.

Remembrance of Things Past

Whenever we inserted the disk drive identificetion in front of e file name, or changed the default device, we usuelly thought of it in just those terms: We were specifying the disk drive to be used. But there is another way to look at what we were doing. By specifying disk drive, we were telling DOS where to look for the directory that contained our files. From e functional point of view, we weren't really specifying the device, we were specifying the file directory; it's just that in the old days, devices and directories matched one-to-one, so we never saw a distinction.

Now, with the tree structure, you can assign several directories to a disk drive. This makes us awere that what we're really interested in is which directory contains our files; the question, "Whet drive slot?" is just a part of the question of "what directory?"

How do you identify which directory is to be used? It's more complicated than identifying e disk device, for two reasons. One is that while disk devices have terse one-letter identifiers, subdirectories allow real names, which can be as long as 11 charecters. (Subdirectories heve nemes to identify them, but each disk volume's root directory doesn't heve or need a neme, since specifying the drive slot identifies it's root directory.) The other reason why

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identifying a directory is more complicated than identifying a disk device, is that the tree structure of directories might have several steps from the root to the directory we want. The term path is used to describe the chain of directories under directories that might be needed to find our way to a particular directory. A path is a list of directory names, with reverse-slashes to punctuate it: \ TOP-LEVEL \ MIDDLE \ BOTTOM \.

Using a path name like this leads you to any files in a directory named BOTTOM. Naturally, this path would only work if MIDDLE is a directory under the directory named TOP-LEVEL, and so forth.

For all practical purposes, these path names are used just in the same way as the disk device identifiers you are used to, but they are more tiresome to type in. Just as there is a default device, which we can change with a command, there is also a default path, which can also be changed, independently. From a practical point of view, the default path is more important than the default device, since it's so laborious to key-in a lengthy path name.

All of this subdirectory and path name business will work on floppy disks, but it is really intended just for hard disk use. There are two reasons for this. One is that there is much less need for subdirectories on a floppy disk since the storage capacity is so much smaller. The other reason relates to timing. Processing paths and subdirectories require much more disk access than ordinary directories do, particularly, more grinding from track to track. This makes it much less practical to use subdirectories on floppy disks. (In fact, many disk operations, such as the CHKDSK command, are much more time-consuming in the 2.0 version of DOS. This is one reason why many PC users who don't buy the IBM hard disk won't be tempted to switch to DOS 2.0).

With DOS 2.0 there is little or no reason to partition the disk at all—with one exception.

Inside the Organization

Given this background, let's look at how hard disk storage can be organized. First, we need to consider partitioning. When you partition a disk, you subdivide it into distinct parts, each of which has its own dedicated storage space. When this is done, each partition acts like a separate disk device. Typically, a hard disk is partitioned to make up exact replicas of the space available on a floppy disk; this approach is used to make the fixed disk more compatible with software that assumes it's working with floppies.

With previous non-IBM hard disk systems, partitioning was common, but with DOS 2.0 there is little or no reason to partition the disk at all—with one exception. The one exception is if you plan to use another operating system that doesn't support hard disk in the same way as DOS; for example, if you use CP/M-86 or the p-system. For these alternate operating systems, you can get the speed advantage of

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hard disk, with floppy compatibility, by creating a floppy-like partition on your hard disk.

Except for this one need, tha natural way to manage space on a fixad disk using DOS 2.0 is to treat all the space on the disk as a huge open pool shared by all the files on tha disk. This avoids one of the problams of partitioning, specifically, a space shortage in ona partition, while others hava space to spare.

The key to organizing the files on a fixed disk lies in a sensible choice of paths and subdirectories. There are many many ways to organize, and many ways to make a mass of it, so you'll need to proceed with care. What's best is going to depend heavily on the nature of your own data, but here are some suggestions that ought to work for most paopla.

Avoid complicated tree structures. it is likely that all you will avar need is one level of subdirectory under the hard disk root directory. At that second level, you can have ona saparata directory for each distinctly diffarent subject. For example, if you have programming tools—compilers, program libraries, the DOS linkar—you might place them all in one directory. if you use an accounting system, you might put all the programs and data into one common directory, or parhaps two: ona for data and ona for the programs. If several people are using the same disk, aach should have a directory for his individual data, whila programs and common data remain in their natural directories.

DON'T FORGET to haul out the trash once a week.

Keep the standard DOS programs and your most frequently used programs in the root directory, rather than in a subdirectory. If you can commonly work with some default subdirectory, but need programs or data that resida in another directory, you may sat up batch files to take care of tha peth eccesses. And if you have space to spare, you can place separate copies of a frequantly uaed program in aeveral subdirectories. If you keep your correspondence on a hard dlsk, you might keep current latters in your master correspondence directory (which should be immediately below the disk's root directory), but move old lettars into subdirectories under the main letter directory.

These suggestions only scratch the surface of what you might want to do with subdirectories on a hard disk, but they should give you some good ldeas for building a systam that suits your particular needs.

The Edge of Space

If you don't think that you could run out of spaca on a 10-megabyte hard disk, you've forgottan tha variation of a classic rule, "Data expands to fill tha alloted space." If you don't hava 10 million bytes of data now, you probably will soon after you get a hard diak syatem. Much of it may turn out to be garbage, so one of the first rules of hard disk spaca managament is "Don't forget to haul out the trash once a waak." Whan this solution no longer does the trick, put tha things you no longer use "in tha attic," meaning off-line storage, or more specifically, floppy disks.

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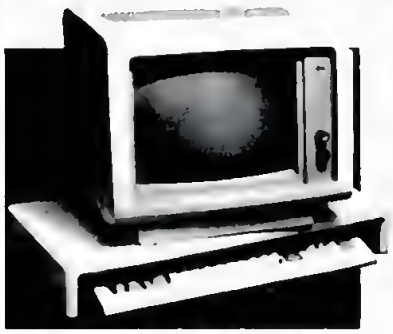

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get another hard disk, then you have to assign priorities to your data. What requires fast access and what doesn't? If you tend to start up soma program, such as a VisiColc spreadsheet, or a *d*Bose II data basa, and continue using it on lots of diffarent data, you would be better to keep the data on the hard disk, and the program on a floppy disk.

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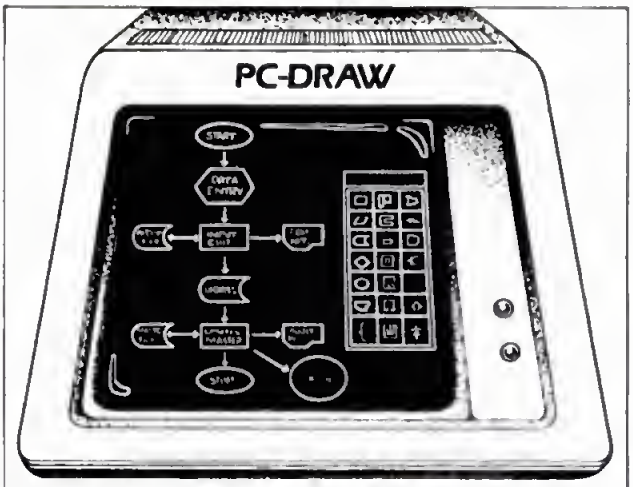
COPY protection has always been a mess, hard disks make the matter more complicated.

in this story are tha ones that don't run under DOS, but require rebooting the system to use them. You won't be able to put evan the data from thesa programs onto hard disk unless tha programs are custom-tailored.

The IBM fixed disk system is barely a month old. Thare will be much mora to say about it as it becomas more familiar to usars. Wa can be confident that it will advance computer capability for users who naed graater fila capacity and faster accass. But like all new technology, it will require a period of adjustement. */PC*

Peter Norton is the outhor of the Norton Utilities programs, ond Inside the IBM/PC, published by Brady. He lives in Venice, Colifornio.



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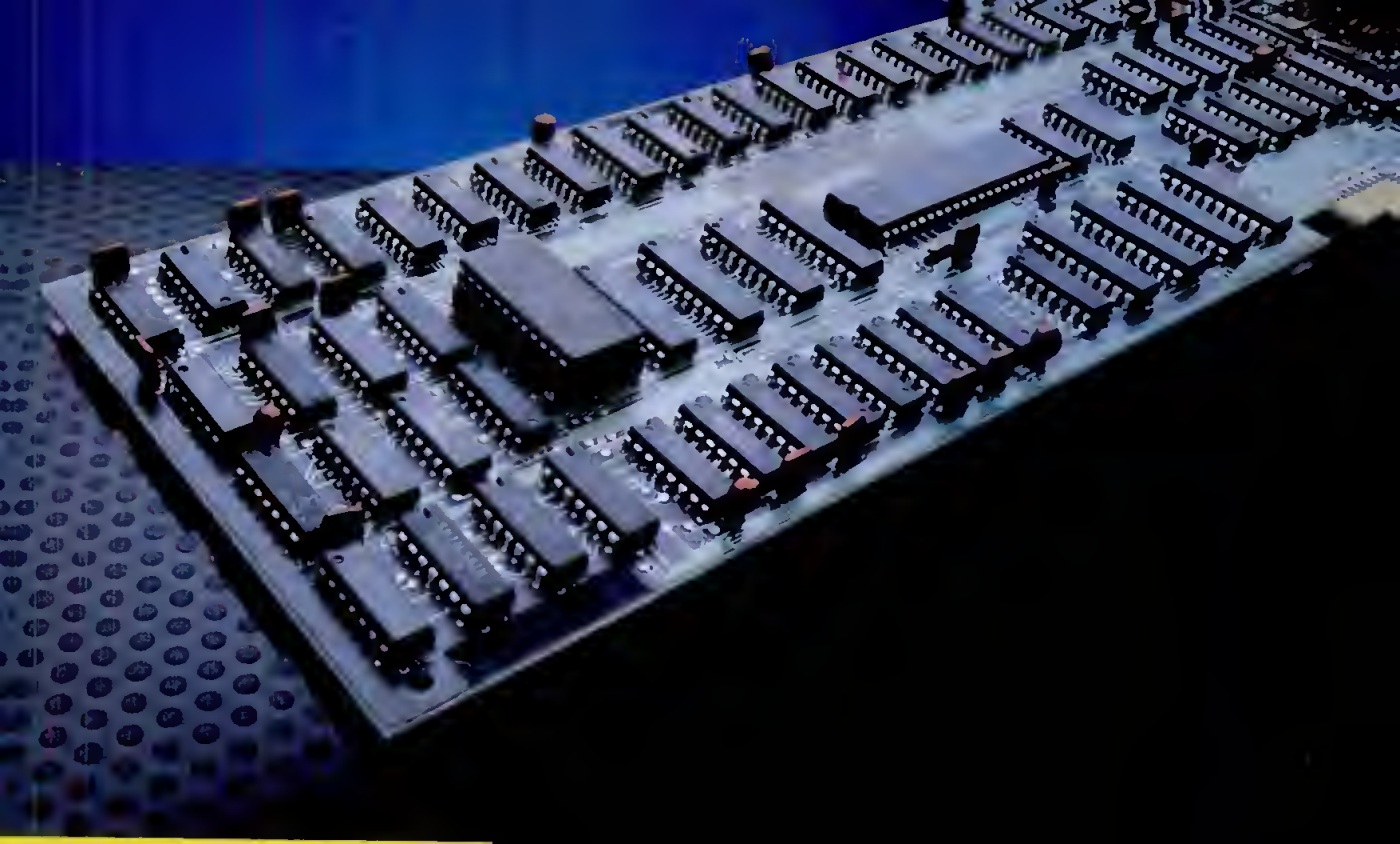

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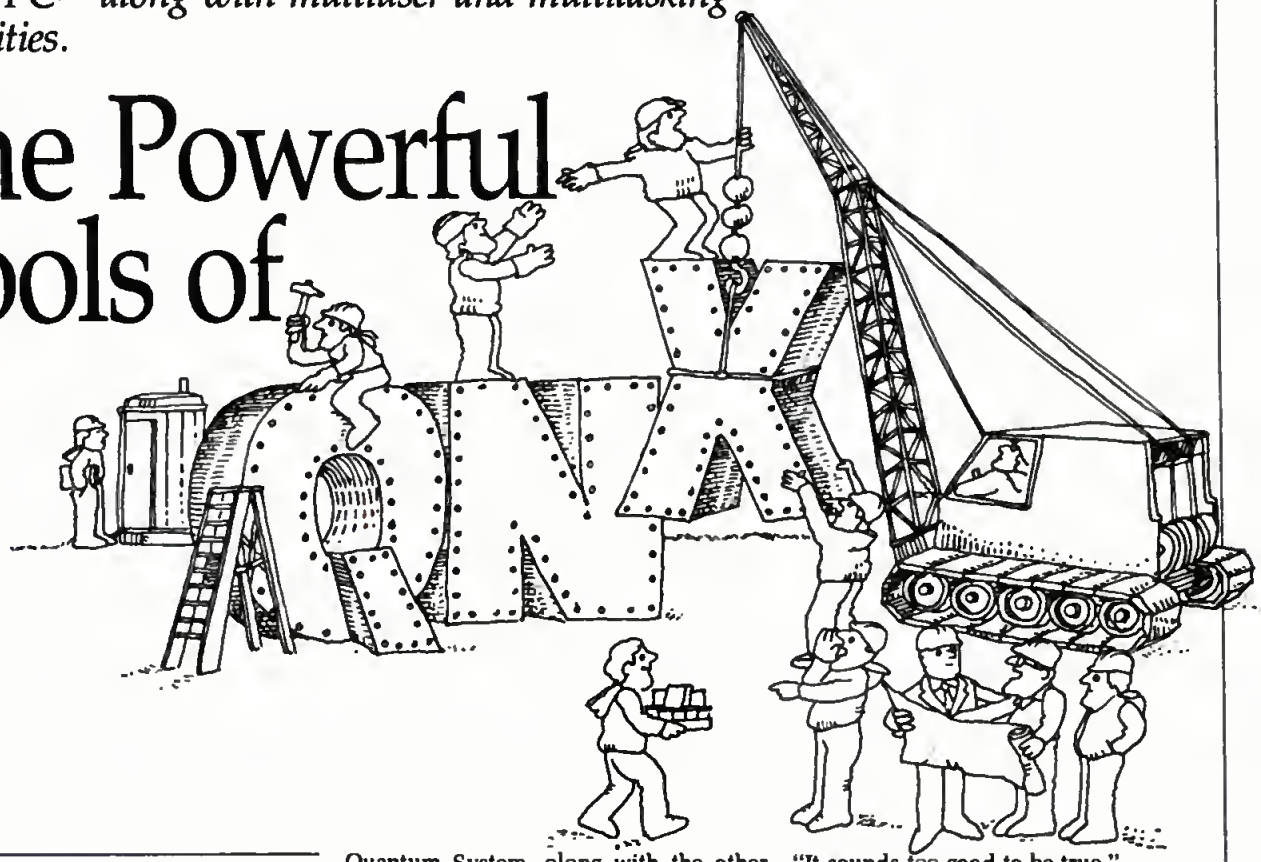

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EDITOR'S NOTE: Quontum Softwore Systems, Inc. recently onnounced thot it wos changing the nome of its operating system from Qunix to QNX. This operoting system is no longar ovoiloble seporately. It is now part of o softwore pockoge colled Tha Quantum System, olong with the other feotures listed in the product identificotion.

The softwore reviewed here by Jomes B. Morris is the QNX operoting system by itself, not the complete pockoge. Even though the QNX operoting system con no longer be purchosed in this form, the operoting system included in The Quantum System pockoge is essentiolly the some os the softwore reviewed here. Therefore, this review should still be useful to onyone interested in the complete Quantum Systam pockoge.

QNX IS AN integrated software environment.

"It sounds too good to be true."

I received this responsa recently from a friend of mine when I asked him if he had seen Quantum Software Systams' advertisaments for QNX, its new operating system for tha IBM PC. As profassional progremmers, wa hed enjoyad the remarkable utility of tha Unix operating system for severel years. Unix has been evailebla on a large number of computar systams, but none of them quelify as personal computers. My friand and I had bean lamanting tha prospect of not heving Unix available to use in developing software on our IBM PC systams.

I had noticad advertisements for a Unix "look-elike" system called QNX soon eftar I obtainad my PC. Like my friend, I was skeptical about those ads when I first saw them. I wondered how e serious effort to develop a Unix look-alike systam for the IBM PC could heve existed without word of it laaking out. I decidad to take e chance; I ordared QNX and installad it on my PC. It took only an hour of using it for

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me to realize that I had gotten my hends on en extreordinary piece of software. QNX is for reel.

Mainframe Software Trickles Down

Parellels can be drawn between the history of personal computing and the early history of mainframe computing. Expe-

I HAD gotten my hands on an extraordinary piece of software.

rienced computer professionels heve hed a strong sense of dejo vu while observing the personal computer industry. Early personel computers were (and many still ere) too smell end too slow to support sophisticeted softwere. As with early users of mainframe systems, assembly lenguege wes the language of choice for serious software development on personel computers. This choice was dictated primerily by memory end processor speed limitations in eerly personel computers. The memory size and "horsepower" just heven't been available to allow bold edvances in software sophistication on personel computers—until now.

The IBM PC is chenging the rules of the game. Its 8088 processor hes e reesoneble amount of "horsepower" end it has a large eddressable memory space. This chenge is sparking e revolution in the personal computer software scene.

Because this new microcomputer power has created a lucretive marketplace, professionel software developers are eyeing the personal computer software markets with a lean end hungry look. When these people errive on the scene, with powerful tools end high-level languages, the rules of the software game ere going to change.

The QNX opereting system is going to play en important role in this transition, not only because it has emerged so early in the transition period, but because what has emerged is of such high quality.

QNX is en Integrated software environment. In eddition to e modern opereting system kernel, QNX conteins e flexible set of tools that cen be combined in meny ways to form even more powerful tools. All of the tools share common operating system interfeces end have common conventions for procedures like naming files, invoking commands, quoting strings, etc.

IBM's PC-DOS is not quite so extensive or consistent. PC-DOS provides en opereting system end no more. If I went en editor, I have to buy en editor. If I went a text formetter and a compiler, I must buy them as well, probably from different menufecturers. Little system integration is possible with this approach. When I get en editor, it's likely to have functions thet overlep with the text formetter. The text formatter has functions that overlap with the compiler. Each piece of softwere hes features that will print a file on my printer, but I have to learn three different schemes to invoke this ection. There is little consistency in system utilities when they come from different vendors.

Throughout this erticle, you will see examples of how integration of QNX tools leads to system-wide consistency. This provides system-wide simplicity and flexibility, end that is what programmer productivity is all about.

From Unix to QNX

Externelly, QNX is very similar to the Unix operating system that was developed et Bell Laboretories during the eerly 1970s by Dennis Ritchie and Ken Thompson. They developed the system largely as a "backroom" research project et Bell Laboratories' Murray Hill facility in New Jersey. In its infency, the system wes used principelly by Bell Laboratories personnel. In the mid-1970s, Unix began to be distributed to outside facilities, primarily universities. The first Unix systems ren on Digital Equipment Corporation's (DEC) PDP-11 series. Unix was immediateiy populer with e devoted, but smell, group of followers. In some university circles end industrial sites, Unix users bad the eppeerance of e mystic cult.

Early Unix systems were not everybody's cup of tea, however. They lacked "production-system" cepebilities; there was initially no file protection mechanism. Also, Bell Laboratories did not support the system in a manner that would allow it to improve rapidly.

Another helf decade passed before two events occured thet provided the impetus behind Unix's current popularity explosion. These events were DEC's introduction of its VAX 11/780 computer end the formetion of a federally supported group for Unix software enhencement. This group, et the Unlversity of California, Berkeley, under the direction of Robert Febry, trensformed Unix into a viable opereting system. Berkeley's VAX Unix system now is used in meny university end private industry installations throughout the world.

To witness the genesis of the QNX operating system, we must turn our ettention to e unique electric trein set in the computer science depertment at the University of Weterloo, neer Toronto. It is an interesting device for teeching the principles of progremming reel-time systems. The electric train layout includes several treck systems, track-switching devices, and trains; the treck switches end treins are under the control of a microprocessor. Students are esked to write programs thet control the concurrent movement of severel treins throughout the track system.

In late 1979, two Waterloo students, Gordon Bell (no reletion to DEC's Gordon Bell) end Dan Dodge, pleyed with these trains in the real-time programming course, teught et that time by Gary Sager. Following this experience, Bell and Dodge were involved in the Thoth operating system project et Waterloo, which wes led by Sager, Morven Gentleman, and Mike Mal-

NEW microcomputer power has created a lucrative marketplace.

colm. After their experience with Thoth, Bell end Dodge began e part-time project to develop e Thoth-like operating system kernel for the 8086 chip Intel wes just beginning to produce. With the addition of a Unix-like human interface to this operating system, QNX was born. Later, the two of them, with Syd Gereghty, who would hendle merketing and administrative issues, formed Quantum Software

Systems, a parent company for the development and support of QNX.

QNX Tools Are Put to Work

Heve you bought a spelling checker

WITH powerful tools and high-level languages, the rules of the software game are going to change.

program for your PC? If not, don't worry. A slmple, but effective, spelling checker can be made by combining three primitive QNX commands, or "tools," as they are often celled. When the following command is typed into Qunix, words in the file named "letr" are compared to a file of correctly spelled words in the file named "dict," and all misspelled words are listed on the terminal!

```
words <letr | sort -u | comm -23
dict
```

Let's look at this spelling checker in more deteil, starting with the first tool, the "words" command. This command reads sentences from a file and writes the words It finds in the sentences as one word per line. It is clever enough to remove a period from the end of a word and to convert all letters to lower case. For exemple, if this is the text In the file called "letr,"

```
The quikc brown
fox jumped
over the lzy dog.
```

the "words" command will write the following lines:

```
the
quikc
brown
fox
jumped
over
the
lzy
dog
```

When I said that the "words" command reads sentences I meant that it reeds sentences that come from what ls called "standard input." The command then writes the individuel, columnized words to "standard output." Normally, standard input comes from the keyboard and standard output goes to the terminal screen. If you type the QNX command words, the

QNX contains tools that can be combined to form even more powerful tools.

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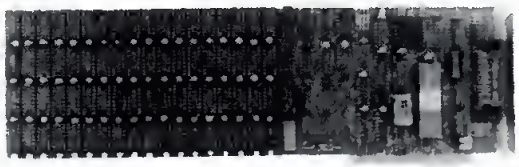

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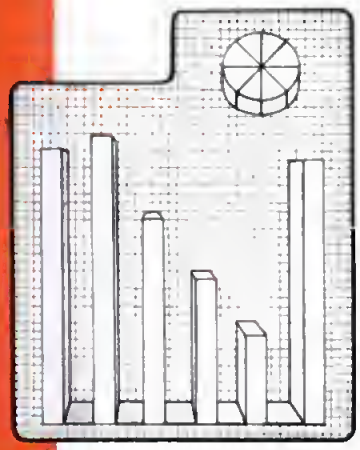

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system will read everything that is typed at the keyboard until you type an end-of-file. Then the keyboarded words will be displayed on the terminel in the single-column format.

Stendard input can originete from sources other than the keyboard. If you type the command words <letr, for example, standard input will come from the file called "letr" insteed of from the keyboard. This procedure is called "redirection" of standard input. Stenderd output cen elso be redirected to e file instead of to the terminal's screen.

THERE IS *little consistency in system utilities when they come from different vendors.*

A command thet reads from stendard input and writes to standard output is called e "filter." Filters are the basic tools of QNX. The "words" command that was used ln the spelling checker is e filter.

The next item of interest in our spelling checker is the | symbol. Typing the command words <letr | sort −u tells QNX to connect the standard output of the "words <letr" command to the standard input of the "sort −u" commend. Whet the special symbol does is called "piping" the output of the command on the left to the input of the commend on the right.

The "sort" command, like the "words" command, is a filter. It is very important to note that there is nothing special ebout the way a filter is progremmed. A filter reads from standard input and writes to standard output. The filter program doesn't know and doesn't care whether stendard input comes from e redirected file or is piped from another command. Similarly, a filter doesn't know or care whether its output is redirected to e file or is piped to another commend. In all these cases, the QNX system takes responsibility for seeing thet information is directed from the correct source to the correct destination. This responsibility never belongs to the filter, so ell filters can be programmed using the same conventions.

THE *integration of QNX tools leads to system-wide consistency.*

The "sort" command should not be too much of a mystery. It sorts words lt receives from standard input and sends the sorted words on to standard output. The "−u" is an option that tells the "sort" commend to remove ell but one of several identical lines that are grouped together efter sorting. Thus, lf the file "letr" con-

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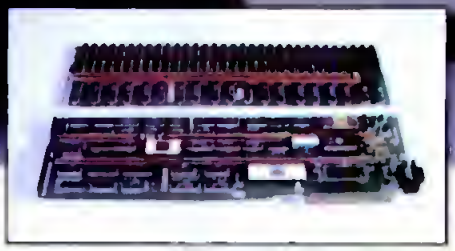

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tains the text given ebove, typing the command words <letr ¦ sort −u will send the following set of words to the standard output:

```
brown
dog
fox
jumped
lzy
over
quikc
the
```

The only other part of the spelling checker that needs to be explained is the "comm −23 dict" command. The "comm" command reeds one list of words from standard input and one list of words from the file thet is nemed es the argument ("dict" in this case) given to the right of the command. By compering these two lists, the comm command generetes three lists of words:

(1) All words thut appear only in the standard input list.

(2) All words that appear only in the given input file ("dict" here).

(3) All words that appear in both input lists.

The words that go into file "1" are either misspelled or are missing from the dictionary. If the dictionary is comprehensive, then most of the words in list "1" are misspelled. List "3" is the list of words in the text that are spelled correctly. This is a rether uninteresting list, es is list "2," which contains all the words in the dictionary that weren't found in the text. Fortunetely, I can specify the option "−23" for the "comm" command, so that lists "2" and "3" are suppressed from standard output. Thus, only list "1," the list of misspelled words, is sent to the standard output. In our example, the following list will be displeyed:

```
quikc
lzy
```

Making New Commands

This simple spelling checker can be packaged into a simple command, called "spell," so I'll never agein heve to type this command as a full line. The file,

EXTERNALLY, QNX is very similar to the Unix operating system.

A SPELLING checker can be made by combining three primitive QNX commands.

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called "spell," will contein this single-line command

```
words <#1 | sort -u | comm -23
dict
```

The "#1" signifies thet en ergument is to be substituted for "#1" when the "spell" commend is invoked. By typing spell letr, the string "letr" is substituted for ell occurrences of "#1" in the file "spell." Then the lines in the file are executed, just as if they were now being typed.

UNIX USERS had the appearance of a mystic cult.

The "spell" commend sends its output to standard output, beceuse the last command in the spell command, "comm," sends its result to standard output. The output of the "spell" command can also be piped to another progrem by typing e commend such as this:

```
spell new_letr | accum
misspellings
```

The "eccum" command reads from standard input. Whet it reeds is both sent to standard output end eppended on the file called "misspellings." With the ebove command, not only ere the misspelled words in file "new_letr" displayed, but also I can keep a record of ell the words I have ever misspelled in a file called "misspellings."

The command line above can be mede into e commend, as "spell" was earlier. The new command can be called by e name such es "acc_spell."

A newly created commend is used just like any of the primitive commands supplied with QNX. In fact, some of the commends supplied by Quantum ere ectuelly commend files thet make use of more primitive commands. Other commands in QNX are actually C programs.

The construction of new tools from existing tools is the essence of the popular "software tool" concept. You'll find it easy to build software tools with QNX because of the simplicity of its construction techniques and the thorough integretion of its opereting system with its command files end the C progremming language.

THE "WORDS" command is clever enough to remove a period from the end of a word.

QNX and the C Language

The C programming language is more

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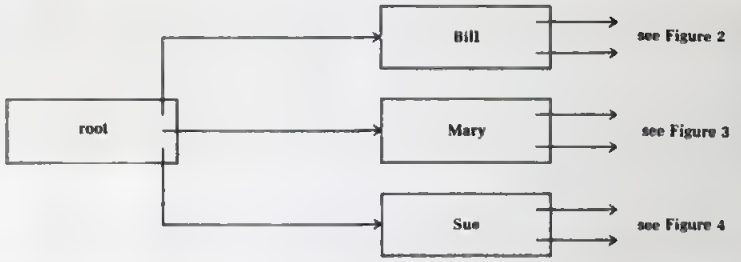
than just one of the prugramming languages that can be used in the QNX system—it is an integral part of the system. This is true not only because C is a very good programming language for systems programming and QNX is written almust totally in C, but also because C is highly integrated with QNX. The C programmer has convenient, simple mechanisms for sending information to and receiving information from QNX. The real test uf this integration is that it would not be tuu much more difficult to have written my "spell" command in C rather than in the QNX command language.

NORMALLY, standard input comes from the keyboard and standard output goes to the terminal screen.

Figure 1: The structure of o root file for the filing system of QNX.



The integration of C with QNX is helpful in obtaining command line information in a C program. For example, if the "comm" program I wrote earlier is to be written in C, the program must have a way to obtain the name of the dictionary file so the file can be opened and read. The mechanism for doing this in a C program is very simple.

A C prugram that implements a "find common lines" program (like "comm" in QNX) within the main program could be as follows:

```
main(argc, argv)
/* "find common lines" program
*/
int argc;
char *argv[];
{
 int (dict_file);
 char c;
  . . .
 dict_file =
fopen(argv[2],"r");
  . . .
 c = getc(dict_file);
```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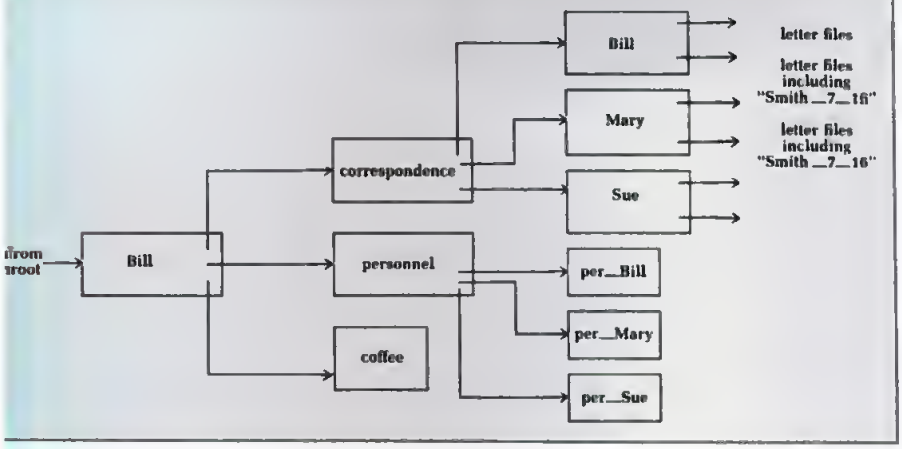
gure 2: *Details of the home file for Bill, the secretary.*



. . .
}

The "argc" and "argv" variebies are initialized by QNX when it sterts running the C languege program. The "argc" variable is an integer thet gives the number of strings to be found on the command line thet invoked the program. The "ergv" variable is en errey thet conteins each of the strings thet were typed on the command line. For exemple, efter I type the line comm −23 dict to ectivate the "find common lines" program, the integer variable "argc" will be initialized to 3, the string variable argv[0] will be initialized to "comm," ergv[1] wili be initiaiized to "−23," end argv[2] will be initialized to "dict."

After this initialization, the C program can open the file from which the "find common lines" program reads its input. The procedure call "fopen(argv[2],"r")" opens the file specified as the third string on the command line. The "fopen" procedure returns an integer that is stored in the variable named "dict_file". When subsequent file operations are performed on this input file, such as "getc" (get character) in the example, "dict_file" will be used to designate the file on which operations are to be performed. In the example above, the file named "dict" will be opened for reeding.

C programs deel with QNX's standard input and standerd output just es if they

FILTERS are the basic tools of QNX.

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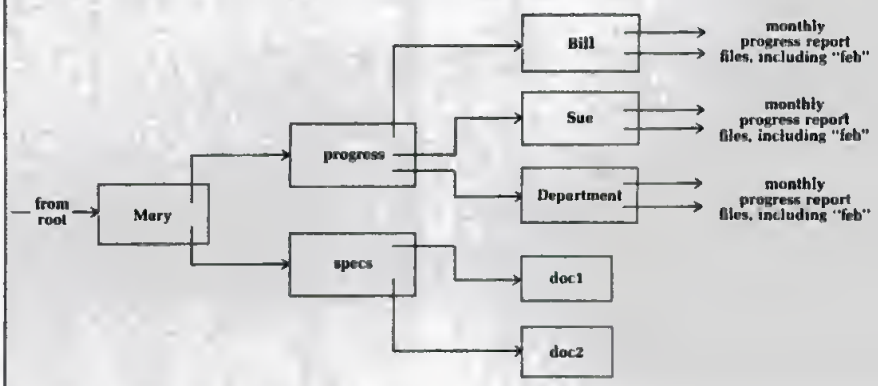
were regular files. When a C program is executed, the predefined integer variables "stdin" and "stdout" will represent standard input and standard output. These

Figure 3: Details of the home file for Mary, the manager.



SOME OF the commands supplied by Quantum make use of more primitive commands.

"files" are openad by QNX before the C program itsalf is executed.

A C program can use file variables like "dict_fila," "stdin," and "stdout" to control the flow of information in a program. For example, this C program will select a file from which it can obtain a character.

```
int f;
char which;
. . .
if (which == 's')
  f = stdin;
else
  f = dict_file;
c = getc(f);
```

If tha variabla "which" contains tha character "s" as its value, then a character will be obtainad from standard input. Otherwise, the character will be gotten from the file associated with the variabla "dict_file."

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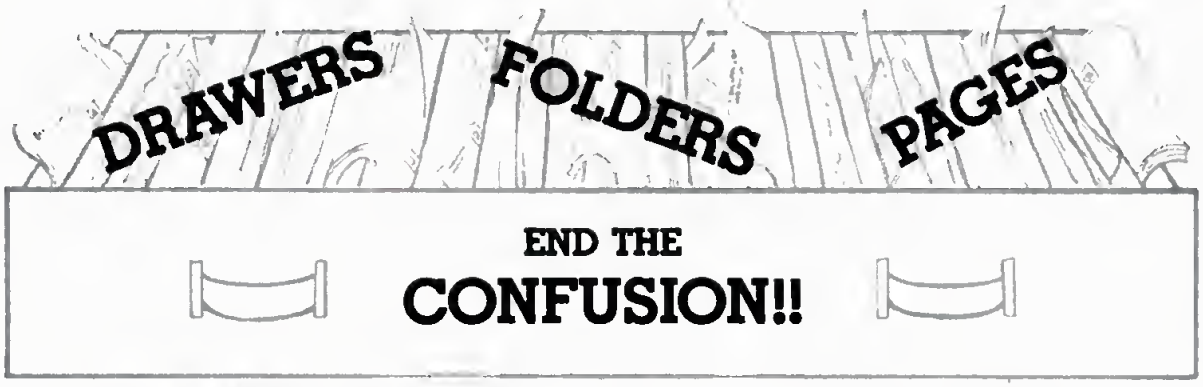

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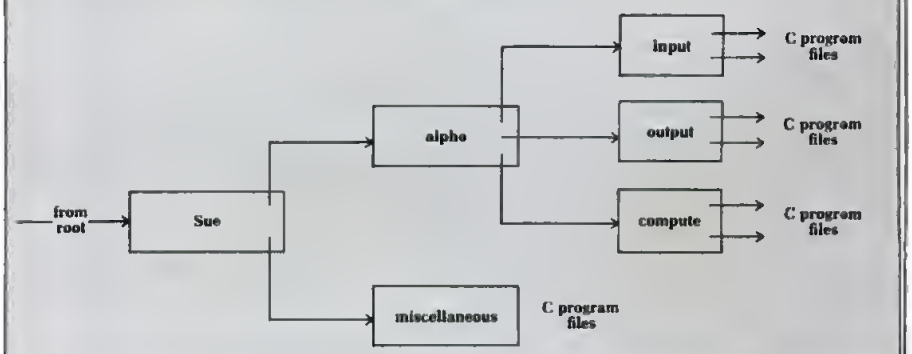
Every element in a QNX filing system is a "file" or a "directory." A QNX file is simply a string of characters. A directory is a special form of file; instead of text information, it contains pointers to other files or directories.

C IS A VERY good language for systems programming.

Files are not interpreted by the operating system. It is up to each individual program to interpret files as it sees fit. This process is simplified by a standard convention for text files that designates the ASCII Record Separator (RS) character as a line terminator.

The most important element in a filing system is its "root" directory. From the root directory, you can reach all other directories and files in the entire tree-structured filing system. A typical QNX filing system is structured so that the root directory first points to other directories. Each of these directories is the "home" directory for a user allowed to use the system.

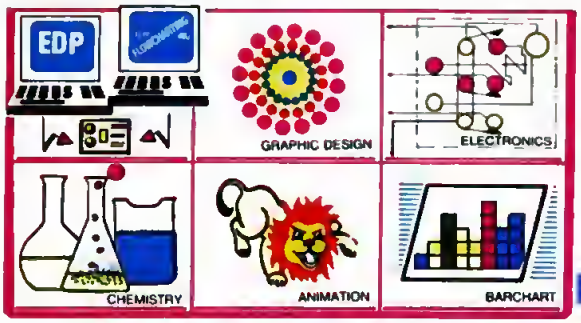
Figure 4: Details of the home file for Sue, the programmer.



A Sample Filing System

Figure 1 illustrates a filing system that will accommodate three users: Bill, Mary, and Sue. The root directory contains pointers to three directories named "Bill," "Mary," and "Sue."

The department secretary is Bill. Bill's home directory (see Figure 2) points to two directories and contains one separate file. The two directories are named "correspondence" and "personnel." His correspondence directory points to three other directories, named "Bill," "Mary," and "Sue," that contain text files representing all the letters that the three employees have written. The personnel directory



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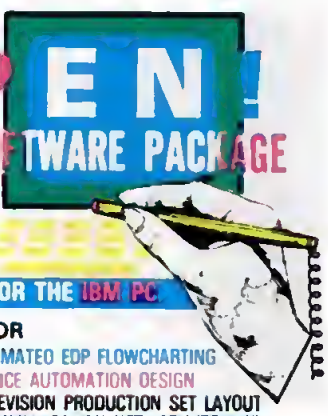

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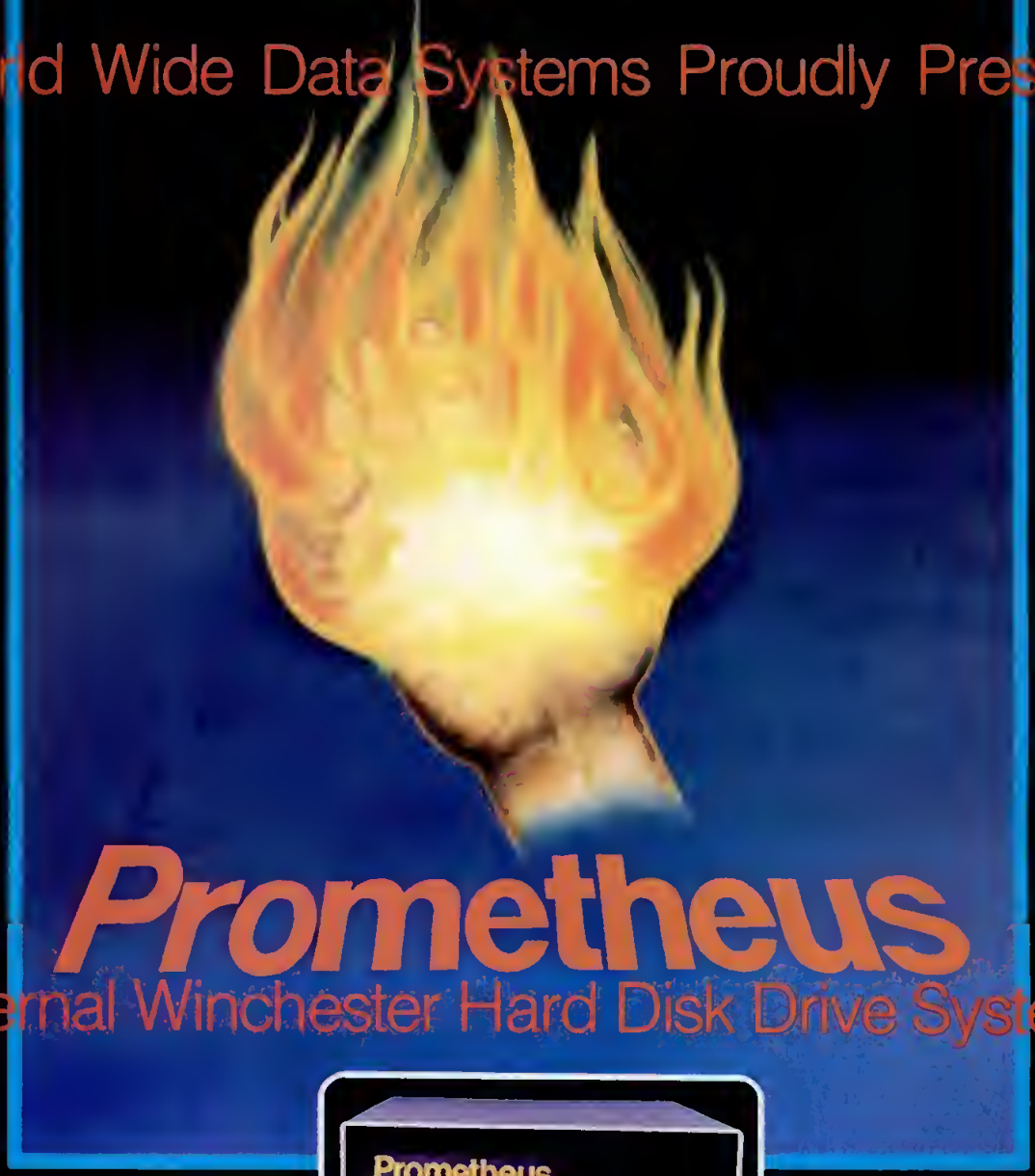

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contains three files for tha personnal records of eech of tha three employees. Tha saparete file in Bill's home directory is a record of monthly payments in the coffee fund.

Tha department meneger is Mery. Mary's home directory (see Figure 3) points to two directories named "pro-

C PROGRAMS deal with QNX's standard input and standard output just as if they were regular files.

gress" and "specs." The "progress" directory points to three other directories named "Bill," "Sue," and "Department." These directories contein text files for the monthly progress reports given to Mary by Bill and Sue, as well es monthly progress reports for the department itself. The "specs" directory conteins the functional specification documents writtan by Mary and Sue to describe the design of Project Alpha, which the department is currently responsible for developing.

The department's progremmer is Sue. Sua's homa directory (see Figure 4) points to two directories named "alpha" and "miscelleneous." The "elphe" directory contains all of Sue's progrems for Projact Alphe. This directory points to three directorias named "input," "output," end "computa;" these represant tha input module, the output module, and the computation module of Sue's full program for project Alpha. Sue is writing the programs in C language. Each of these directories contains text files that represent C procedures, one C procedure per file. Storing each C procedure in e separete file mekas it eesy for Sue to edit end meintain her C programs since she doesn't heve to initialize a large file any time she uses the editor to change one line in a procedure. When she compiles the full set of C programs, tha C compiler will autometicelly gather up all the files into one file for compiling; Sue won't heve to do this herself.

Sue's othar directory, named "miscal-

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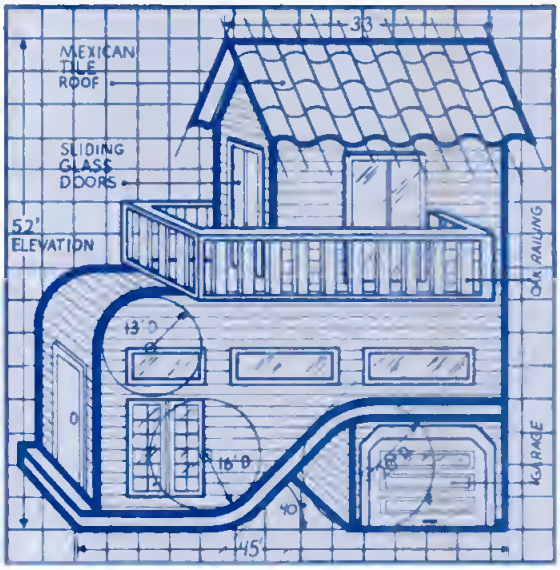

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leneous," is really e geme-playing progrem, written in C, thet Sue wants to market. She calls the directory "miscelleneous" to disguise its reel purpose.

Now thet I have e semple filing system structure to refer to, I can demonstrete how files ere referenced and how to move around in e filing system. Suppose I want to list Sue's February progress report on the printer. I cen't simply type list feb. Since there ere three files named "feb" (two for Bill and Sue and one for the depertment), the name by itself is ambiguous. I could resolve this embiguity by specifying the file named "Sue/feb". This seems to refer to the file "feb" In directory "Sue" of directory "progress"—but is it specific enough? What if e file named "feb" is listed in directory "Sue" under root? As before, I can provide more context to solve the ambiguity: the file can be referred to as "progress/Sue/feb". If this still might be ambiguous, the full filename, "root/Mary/progress/Sue/feb," can be given. When the full filename is used, there can be no embiguities because it is illegel for two elements in e single directory to heve the seme neme.

Shortcuts for Filenames

From the above discussion of filenames, you might have the impression that a good deal of typing goes on in using QNX. In practice, this is not the case at all. You'll seldom heve to type e filename with even a single slash (/). Thls is because QNX allows several ebbreviations and shortcuts in its filename conventions. First, in a fully specified fileneme, the "root" name never needs to be specified. The correct formet for the full fileneme given ebove is "/Mary/progress/Sue/feb."

An even more useful shortcut is the "current directory" convention. When a user is logged in on a QNX system, there is always a "current directory" essociated with the user. For exemple, because of the commends Bill hes performed in the past, his current directory might be named "/Bill/correspondence/Sue." If Blll refers to a filename that does not start with a slash, the neme of hls current directory is prepended to the front of the specified file name. Thus, if Bill refers to file "Smith_7_16" while in the ebove current working directory ("/Bill/correspondence/Sue"), the file nemed "/Bill/correspondence/Sue/Smith_7_16" will be accessed.

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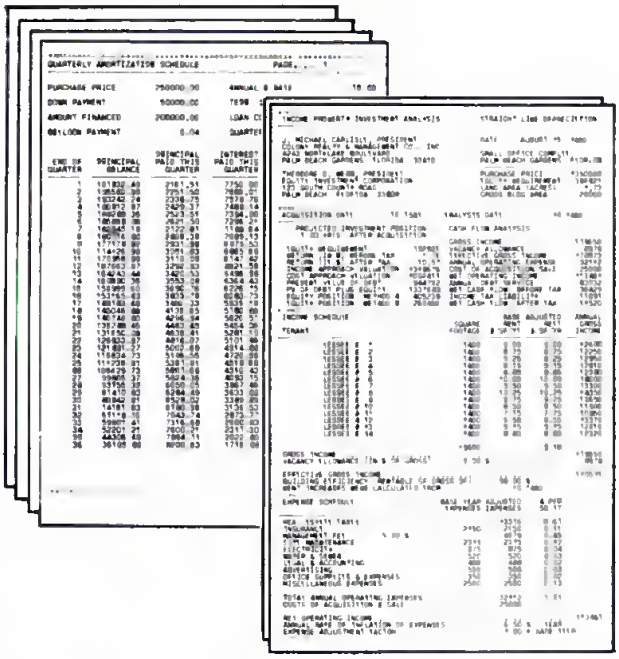

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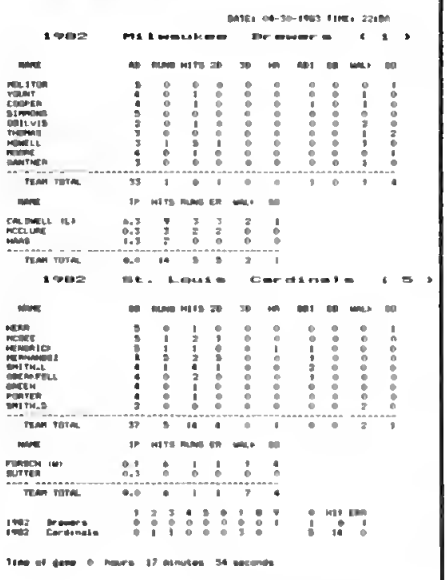

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If e file is not in the current working directory, or is below its level, then it can be accessed by giving its full filename. In this cese, there's another shortcut thet can seve some typing. Tha caret symbol ("^") cen be used to indicete the directory that ls up one level in the tree. Bill cen refer to the file "Smith_7_16" ln Mary's directory by using "^Mery/Smith_7_16" as tha filename. Since hls current directory is "/Bill/correspondance/Sue," this nama eccesses file "/Bill/correspondenca/Mery/Smith_7_16." Another alternetive is to move to a new current directory. To chenge his current directory to "/Blll/correspondence/Mary," Bill can type cd ^Mary. After executing this changa, Bill can now refer to the fila that was accessed ln the last paregraph as ("^Mary/Smith_7_16") as simply "Smith_7_16." The full neme of the eccessed fila ls ectuelly "/Bill/correspondence/Mary/Smith_7_16."

File Protection

Personel computer operating systams have not tradltionally supported protected filing systems. In tha example ebove, the personnel directory certelnly conteins sensitive informetion that should not be eccessible to everybody. Similerly, Sue probably doesn't want to have Mary snooping around in her "mlscelleneous" directory! QNX supports a two-level file protection scheme, so fila permissions can be specified for the owner of the file end for each of tha other users. QNX supports four file protection permissions: read only, write only, append only, end execute only. By combining these permissions, a file can be classified for any user as reed and execute only, read end append only, etc.

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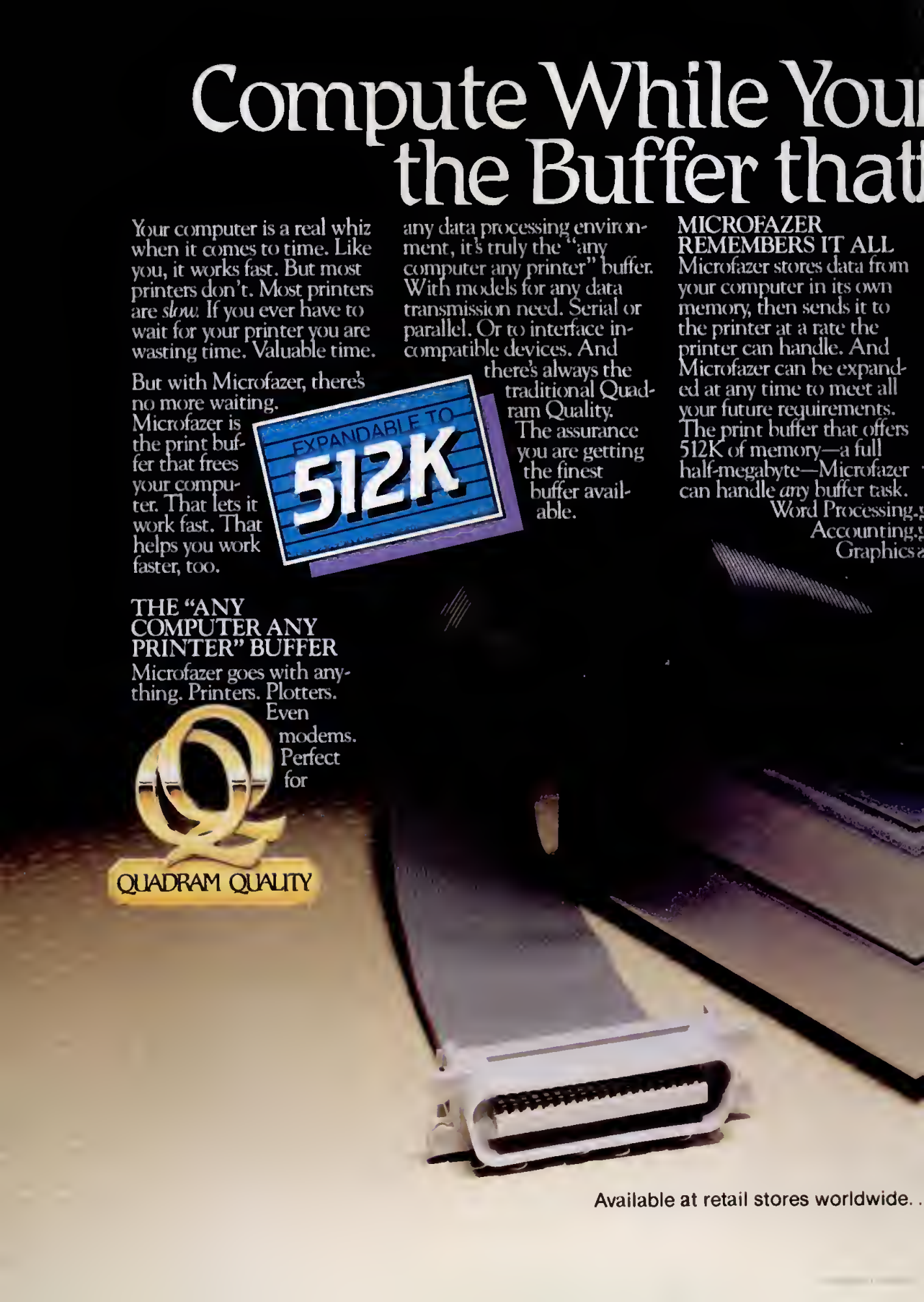

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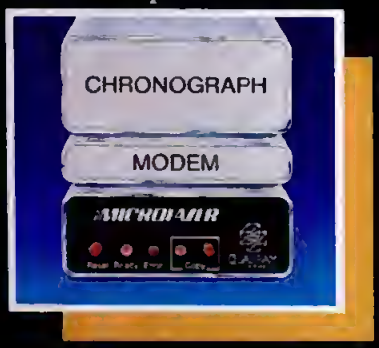

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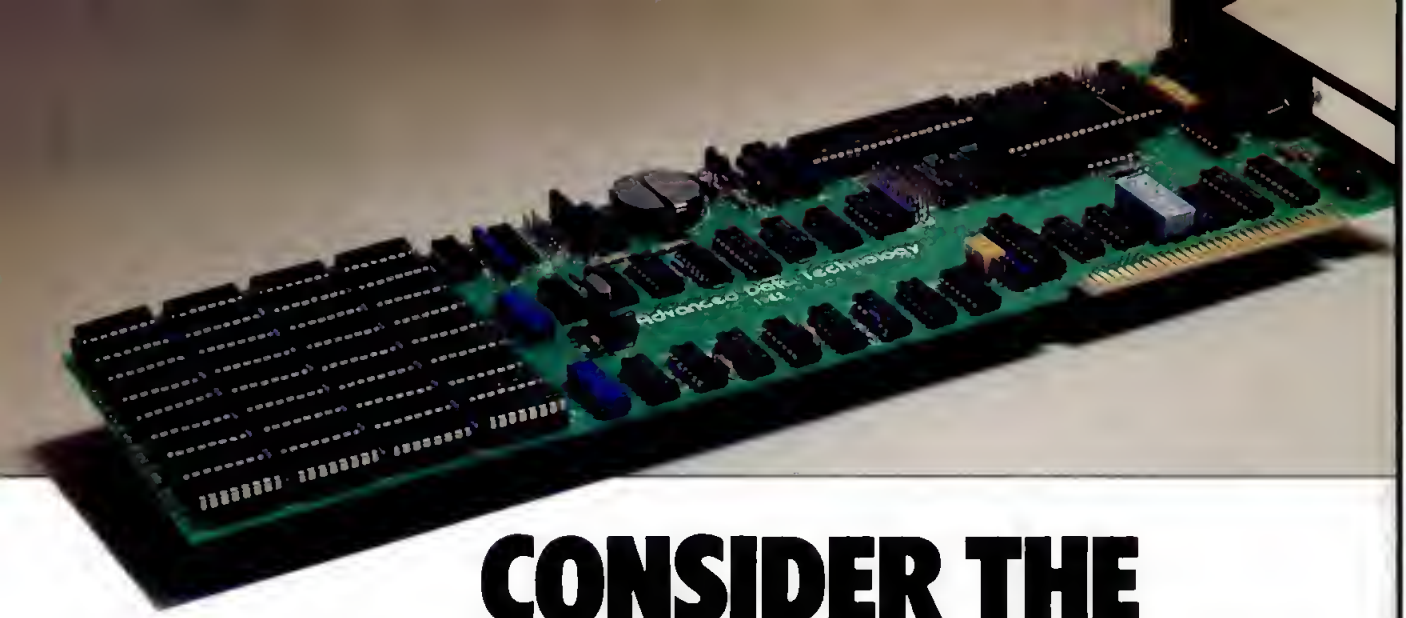

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A Multitasking System

QNX is a multitasking operating system, able to maintein several programs, or "tasks," in verious stages of completion, that can be selected for execution in any order. QNX can switch the processor among different tesks; eech is performed in a short time pariod callad a "time-slice," so no task is delayed for a long pari-

EVERY element in a QNX filing system is a "file" or a "directory."

od of time.

A single-tasking opereting system can maintain only one ective progrem at one time. Have you ever esked your PC to print a long file end then wented to do some editing while the printer was cranking away? On e single-tasking opereting system, your quote of one tesk is used up by the printer. You can't edit until the printing is finished because your operating system will only support one ective tesk et a time. All you cen do is go get some coffee and twiddle your thumbs.

A multitasking operating system can print a fila, ship another file to another computer over a communications link, compile e program, and ellow e file to be edited, ell at the same time. Not only that, but whan an operating system elready supports multitesking, it is feirly easy to make it support multiple users. QNX does this.

Here's an example of how QNX can maintain several active tasks at onca. First, I start the task of printing a file by typing list game.c &. The "&" tells QNX that listing tha program "gama.c" on the printer is one of e series of tasks. After I type this commend, the opereting system's prompt comes back right ewey. QNX is waiting for another command! Meanwhile, the printer starts listing tha file.

If the command was typed without the "&" as list game.c, the file would still be printed, but a prompt wouldn't come back from QNX until the print task was finished.

Now that the printer has started listing the file and a prompt hes come beck from

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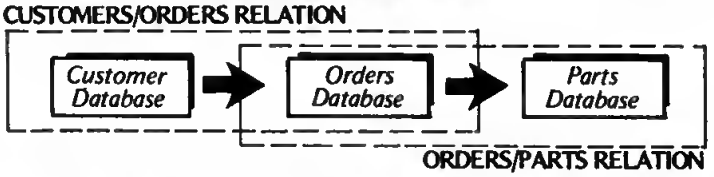

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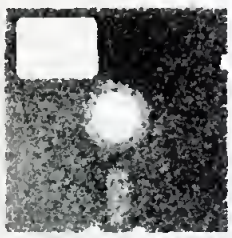

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QNX, I can issue another command. This time the command is cc game.c &. This starts the C compiler compiling the "game.c" program. Again, a prompt comes back from QNX immediately. While the second tssk is active, QNX is ready for another command to be issued. Even though the C compiler has started to compile the program, I em still free to edit enother program if I wish.

Pipes

You can't fully appreciate the real besuty of QNX until you understand how "pipes" are implemented in QNX. The relationship of pipes to multitasking is the strongest example of the consistency and simplicity of QNX.

Recall the spelling checker command, named "spell," that I had creeted.

```
words <letr | sort -u | comm -23
dict
```

When this command is issued to QNX, three tasks ere started simultaneously: "words," "sort," and "comm." Two pipes are also initialized, one between "words" end "sort" (the w-s pipe) and one between "sort" and "comm" (the s-c pipe). To simplify things here, think of e pipe as consisting of a block of N memory words and an integer veriable C that is a count of the number of bytes currently stored in the memory block. if C = 0, then the pipe is "empty." If C = N, then the pipe is "full."

Immediately after the spelling checker command line is issued, the three tasks begin execution end the following happens:

(1) The task "words" starts to read from file "letr" and write to pipe w-s.

(2) The task "sort" tries to read from pipe w-s, but finds it empty.

(3) The task "comm" tries to read from pipe s-c, but finds it empty.

At this point, QNX puts the tasks "sort" and "comm" to sleep, so only the task "words" is running. It continues to resd from file "letr" and put information into pipe w-s. Two events can occur to change the state of affairs:

(1) Pipe w-s fills up.

(2) The task "words" uses up its time slice.

When either event occurs, the QNX system comes back into the picture and notes that some action is required. Let's assume the second event has occurred; it

is more interesting and it occurs more oftan than tha first avent. Since the w-s pipe is no longar empty, tha "sort" task has somathing to do, so QNX wakas it up. Task "words" still has something to do, because the w-s pipe is not yat full. So tha

QNX WILL share the processor among all active tasks, each for a short time slice.

tasks "words" and "sort" are both awaka and ready to run at this point. QNX now must decide which task to run. This process is called "scheduling" a task for execution. After one of the tasks is scheduled, axecution of the task begins and QNX leaves tha picture. This alternation continues until all threa tasks are complatad.

It is vary likely that sometime during tha execution of the "spell" command all three tasks will be awake. This situation occurs when both pipes are nonempty and nonfull. When this happens, QNX will shara the processor among all three active tasks, each for a short time slice.

On parsonal computers, espacially those with very slow peripharal devices, it is important for an oparating system to be like a jugglar who keeps a lot of balls in the air. It is particularly important to be abla to hava the processor running and doing useful work at the same time that reading to and writing from a disk is occurring. Otherwisa, work is delayed while the processor must wait for tha floppy disk to finish, which must then wait for tha processor to finish, which must then wait for the floppy disk, etc.

The IBM PC is a substantial computing system, but its full potential can only be realizad when multitasking can be used. QNX gives you the powar to maximize utilization of the PC's resources. */PC*

Jomes B. Morris is o consultont in the computer field ond on odjunct ossociote professor of computer science ot the Oregon Graduote Center.

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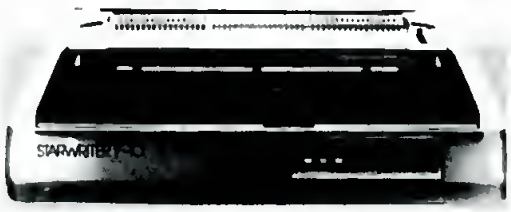

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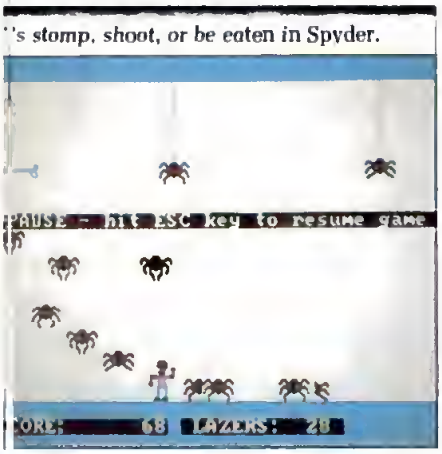
CIRCLE 610 ON READER SERVICE CARD

This is a creepy game, but oh so very well designed. Spyder casts you es a little person on the floor of a cave. From above, stowly at first but soon at a frenzying pece, clutching spiders descend from the top of the screen. If you can position ynurself squerely underneath one of the spiders, you have a few chances to fire your "lazer" into his beady little eyes. But don't teke too long, for these spiders spin deadly webs. If tha spider makes it all the way to the floor of the cave, it will begin scurrying towerd you. Your lezer gun won't shoot sideways, but you are equipped with a secret weepon, huge cartoon-like shoes thet you cen direct left or right to squash an offending arechnid.



's stomp, shoot, or be eaten in Spyder.

If all of this sounds frantic, you're right, but you haven't seen anything yet. In tha upper levels of this geme a pair of scissors occasionally scoots ecross the screen, cutting the strings above whatever spiders it passes. They then drop to the floor quickly and head right for you.

The quality of the graphics falls somewhere between excellent and superb. The spiders are two-colored, with gleaming eyes. The little man is three-colored, with moving arms, legs, head and oversized L.L. Bean mukeluks. The little scissors snip es they cross the screen. The spiders dence a ballet of conquest when they've trapped you, and then proceed to spin a bright red web around your body. One minor flaw: the spiders have six legs, which is fine for insects, but hardly sufficient for octopeds in gnnd standing.

THE SCREEN suddenly fills up with hundreds of gloating spiders.

The tour-de-force of the game comes after you have been captured. After the dance and the web-spinning, the screen suddenly fills up with hundreds of gloating spiders. Creepy!

The sound effects have not been overlooked, either. The intensity, pitch, and tempo of Spyder increases with eech threet to your personal safety. You heer e warning beep when you run out of lazers, end e congratuletory whistle when you move your little man over to the energy pack for a recharge.

There are many nice touches to this game. Your score increeses for eech spider you shoot or squash, of course, but you lose points when you fire and miss. The game can be stopped in midplay and resumed, the sound can be toggled on or off at the start of play, end the game mainteins e record for high scores. To give you something to shoot at, it includes an outrageously high score racked up by Edward Weed, identified in the credits es the game's designer.

The gama wes tested on two different RGB monitors with very impressive results. The display was also checked on e monochrome monitor ettached to the color/graphics edapter and found to be quite playable if somewhat less attractive. One problam, not the fault of Mirrnr Imeges Softwere: Spyder would not run under DOS 2.0, apparently beceuse of a chenge in memory eddress in that new operating system. I'm sure this is not the only instance of such incompatibility, and I imagine it can he corrected by software dasigners. I'd award this game fiva creeps end a crawl out of five. —Corey Sandler

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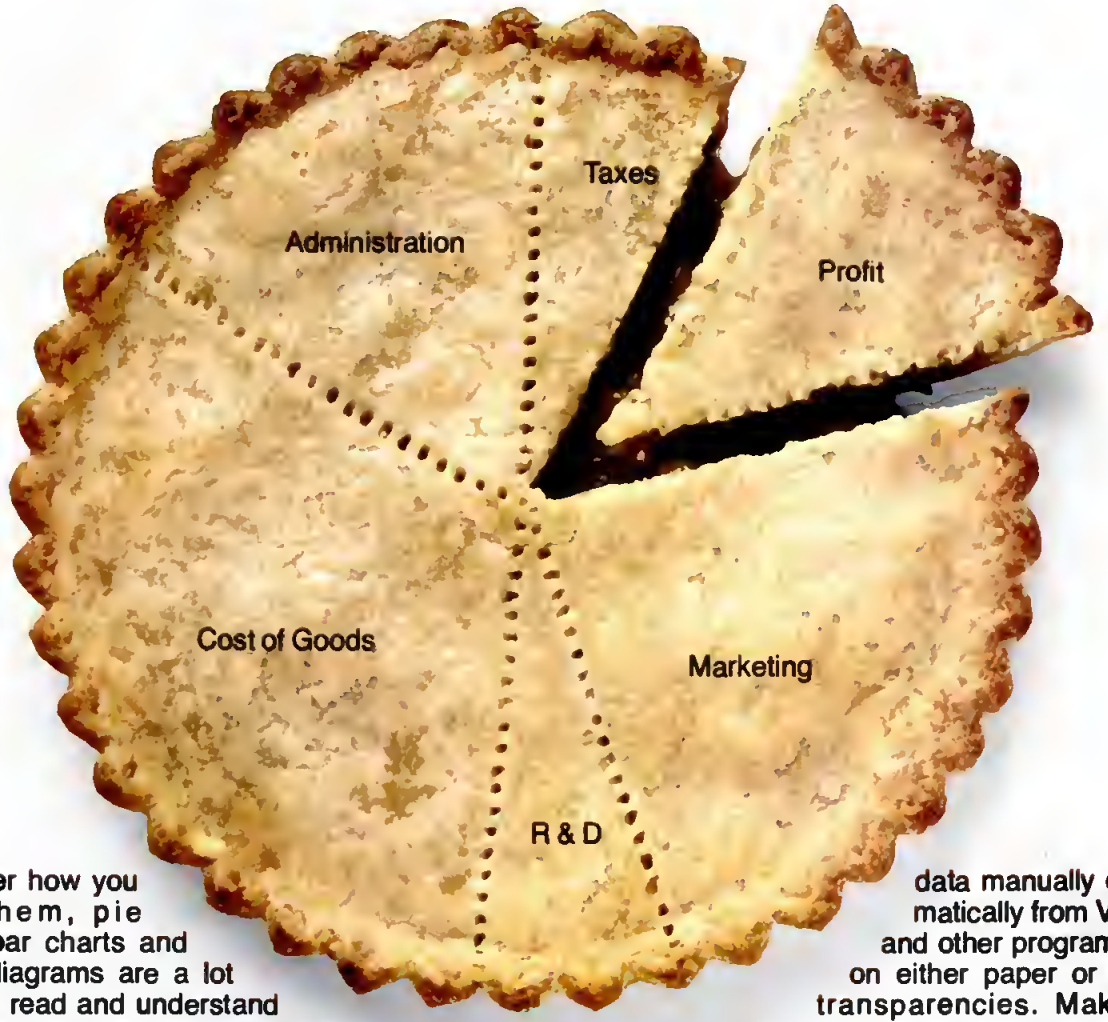

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CIRCLE 221 ON READER SERVICE CARD

game. Sooner or later those aliens are really going to get angry.

Terran Jeopardy is the latest in this tired craze. It includes only a few minor variations worth mentioning. What is worth pointing out, though, is the fact that an unwary buyer might never know that inside the attractive folder for this product is yet another version of Spoce Invoders. Another point is the claim by the developers that this is a "fast and furious arcade action game." Those words might serve to make you furious, fast. The game is much slower than many other PC games recently tested, and the play action is severely hampered by the fact that the program appears to handle only one action at a time.

In fact, the game is so sluggish when you fire at the aliens that you can rack up very high scores by keeping your finger on the firing button at all times.

The game does not use joysticks. The left and right arrow keys move the defending ship, the space bar stops its motion, and the F key is the firing button.

There are a few pluses. The sound effects are very much like an arcade version (they can be shut off, too). The aliens are pretty, and the yellow and red explosions of your defending base are convincing. There is, however, no way to store your high score on disk and no way to suspend the game in mid-shoot-em-up.

—Corey Sondler

FLIPPERBALL
Distributed Software Systems, Inc.
P.O. Box 1301
Northbrook, Illinois 60062
(312) 634-1511
List Price: $29.95
Requires: 64K, one disk drive, color/graphics adapter, color or monochrome monitor or television.

CIRCLE 648 ON READER SERVICE CARD

You might want to mount your PC on shock absorbers before you make Flipperboll a part of your collection. This program is an impressive simulation of a pinball machine, the electronic "ball" bounces off bumpers, momentarily hangs onto magnetic traps, and ricochets off walls on the screen. It's not the competent graphics or the cute sounds that make this game interesting, though, it's the first-class replication of the laws of physics.

Flipperball *screen at rest*

The screen display for Flipperboll shows a green square with red extra-point outlines on some bumpers. The yellow ball, which is actually squared off, rests in

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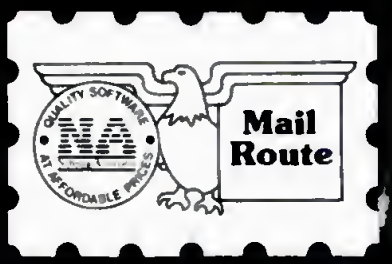

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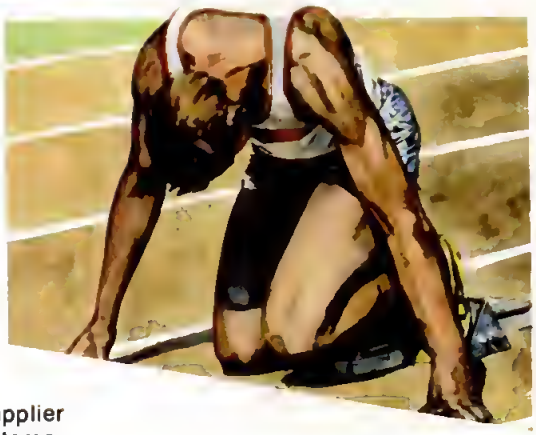

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CIRCLE 335 ON READER SERVICE CARD

OPEN SYSTEMS INC

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(612) 870-3515 TWX 910 576 1743

The SOFTWARE FITNESS PROGRAM™

a side channel abova an approximation of the mechanical plunger that starts a real pinball on its way. You pull the plunger down using the down arrow on the cursor pad, and release it by typing the Return key. Just as in a real mecbanical game, the farther down you pull the plunger the more vigorous the release and the harder the ball will fly into the raceway at the top of tha screen. Pulling the plunger too "lightly" will send the ball only partly up the chute.

THE ELECTRONIC "ball" bounces off bumpers, momentarily hangs onto magnetic traps, and ricochets off walls on the screen.

Flipper controls are the back slash (\) and forward slash (/) on the PC keyboard—appropriate and convaniant choices. The first display allows you to change game options. The F1 function key turns the sound on or off. F2 allows choice of type of monitor: high resolution, medium resolution, or television screen. The game was tested on two different color monitors and a monochrome screen driven by the color/graphics board. On the monochrome screen, the high-persistenca phosphors left a ghostly trail bahind tha ball for a few fractions of a second, which was not displeasing but was occasionally distracting.

Two other controls, F3 and F4, allow you to move the image left or right on a television screen if necessary. Finally, F9 displays the disk record of high scores. You can pause the game by pressing the F10 during play; pressing the Escape key bombs the program out and returns the user to the DOS prompt.

The only thing really missing from *Flipperball* is a way to apply a littla body English. No matter how much I leaned into the kayboard, tha ball still insistad on obeying tha law of gravity. But than, tha Pinball Wizard didn't naad any lights a'flashing and never tilted at all.

BRIDGE BiDDER
PS Softwara
P.O. Box 25
Roseland, NJ 07068
List Price: $35
Requires: 64K, one disk drive, printer optional.

CIRCLE 608 ON READER SERVICE CARD

Bridge is a game played by four people using a standard deck of 52 cards. At tha start of a hand each player is dealt 13 cards. The object of the game is for a partnership to contract for a number of tricks during the bidding and for that partner-

CIRCLE 243 ON READER SERVICE CARD

Enjoy the RAMit

PDI464

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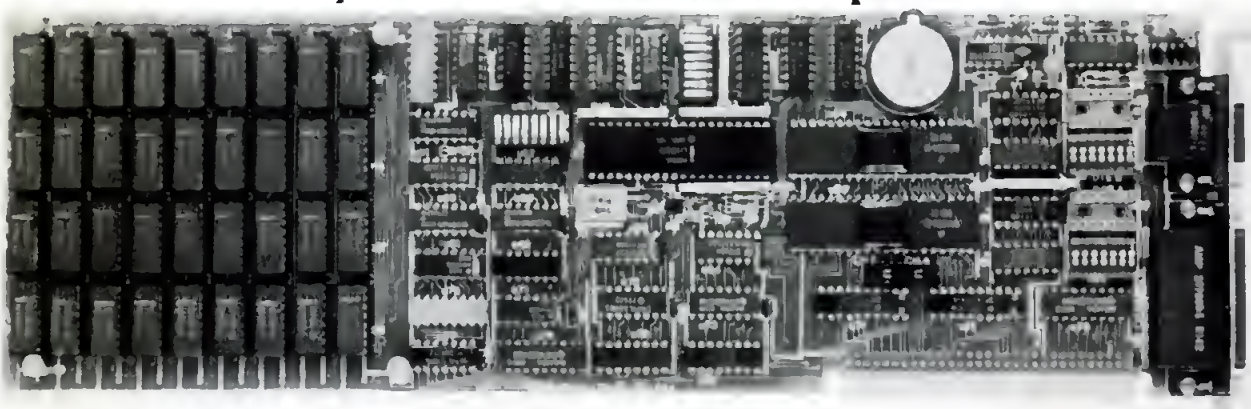

The PDI464 features six separate functions — expansion memory, two asynchronous serial channels, a real-time clock, a disk emulator, and a print spooler. Together with its high quality, the PDI464 offers a price-performance ratio that is tough to beat.

The memory section of the PDI464 provides up to 256KB of fully socketed expansion memory with parity generation and checking. Four memory sizes are available from 64 up to 256KB to meet a variety of needs. Regardless of memory size ordered, each PDI464 is tested with a full compliment of 256KB of memory to ensure trouble-free future expansion. Disk-based memory diagnostics are included which can test memory integrity and report problems down to the chip level.

Two asynchronous serial channels are provided which are completely compatible with IBM serial channels. Each channel can be selected to reside at one of four addresses to allow for future expansion. A unique feature is provided which allows simple selection of data terminal or data communication equipment [DTE/DCE] configurations, thus eliminating the need for special cables or null modems. Each channel comes complete with a 6 foot RS-232 cable.

The Real-Time Clock section features quartz-crystal control and lithium battery back-up to ensure years of trouble-free operation. The RTC features hours, minutes, seconds, day-of-the-week, date, month, and year with automatic leap year adjustment. Software is provided to initialize system time and date information automatically upon power-up.

p-Disk™, a disk-emulation package provided with the PDI464 allows memory to be treated as an ultra-fast disk drive. p-Disk™ can be configured as a single or double-sided drive and can appear as drive B, C, or D. p-Disk™ does not require modification or patching of the BIOS or DOS files on system diskettes and is fully compatible with IBM software and diagnostics.

A background printer spooler is included with the PDI464 which allows files to be printed on a printer while other software is being used in the foreground. The spooler offers features such as menu-selectable configuration, multiple copies, and upper case options.

Comprehensive documentation is provided with numerous illustrations to simplify installation procedures. All documentation fits neatly into existing 3-ring binders provided with the Personal Computer.

Each PDI464 is "burnt-in" at elevated temperatures and fully tested. Packaging material provides protection from static and mechanical shock during shipment to further ensure reliability. The PDI464 is covered by a one year limited warranty.

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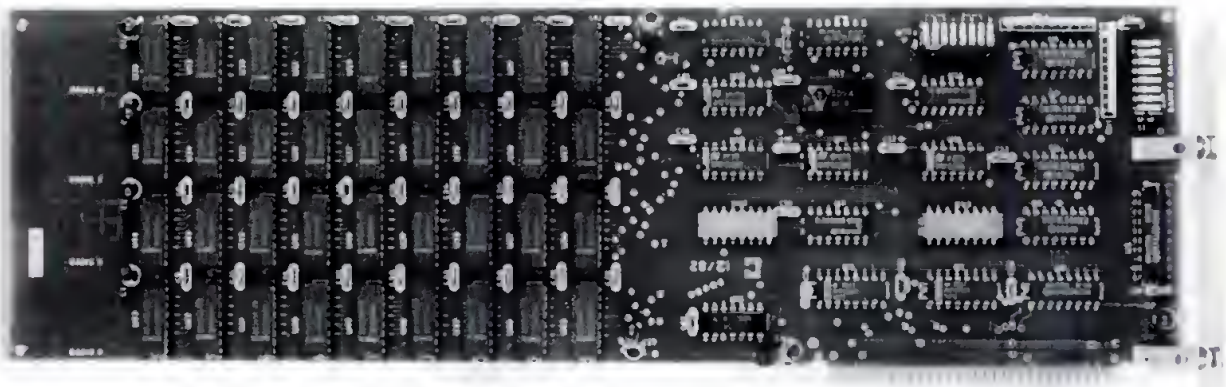
256KB Expansion Memory for your IBM Personal Computer.



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The PDI 256 provides up to 256KB of user memory with parity on a single expansion board for the IBM Personal Computer. Memory is organized as 4-64KB memory banks, each bank can be set to any 64K boundary within the 1 MB address space. Individual memory banks may also be deselected. All address mappings are made by DIP switch settings for easy configuration. All RAM chips are socketed to allow for easy memory add-on or replacement. Memory refresh for PDI series memory boards coincides with the planar board's refresh. No wait-states are required for expansion memory accesses. The PDI 256 is also available in 64, 128 and 192KB versions which are easily upgraded in 64K steps to a maximum capacity of 256KB.

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CIRCLE 105 ON READER SERVICE CARD

ship to win et least thet numbar of tricks during tha play.

The *Bridge Bidder* does not teach users how to play bridga. It is a simulation program that taachas beginnars how to bid and halps to sharpan the skills of experianced playars.

The menual thet accompenies the disk explains the languaga and basics of bidding to beginnars in five lessons. Aftar going through tha bidding, the computer displays tha cards in all four hands, allowing the usar to saa if the final contract was appropriata. If tha player wants to try e diffarant bid, tha computar repeats tha hend.

Duplicate Hands

The menual takas the player from how many cards aach person is deelt to how to bid in most situations. Three quizzes follow the opening three lassons.

Lesson Ona taaches tha player how to evelueta a hand by counting tha high card points end the distribution points. The directions are claar and leerning tekas about an hour.

Lesson Two tests a playar's understending of opening bids. Lesson Three covers tha player's understanding of tha responder's bids, the response a player makes to a partner's opening bid.

Playars have an almost unlimited number of hands eveilabla for practica. By keeping track of the number used to generate the hand, you can call up the seme cards over and over to see how a diffarent choica of bids affects the final contract. The ebility to duplicata tha hand means that partners can play the same cards and increase their undarstanding of one another's behavior, often a sore point in a real game.

INSTRUCTIONS are given for loading the necessary DOS and BASIC but not for copying them onto the program.

Bidding is based on tha commonly usad Standard Amarican system. The use of "weak two bids" is optional.

Shuffle And Deal

In ganaral, tha screen prompts are good and the kaystrokas for entaring a response are minimal. Tha *Bridge Bidder* gives plenty of exemples so the baslcs get embedded in tha mind painlessly.

THE PROGRAM usually bids correctly, but there is no excuse for its occasional illegal bid.

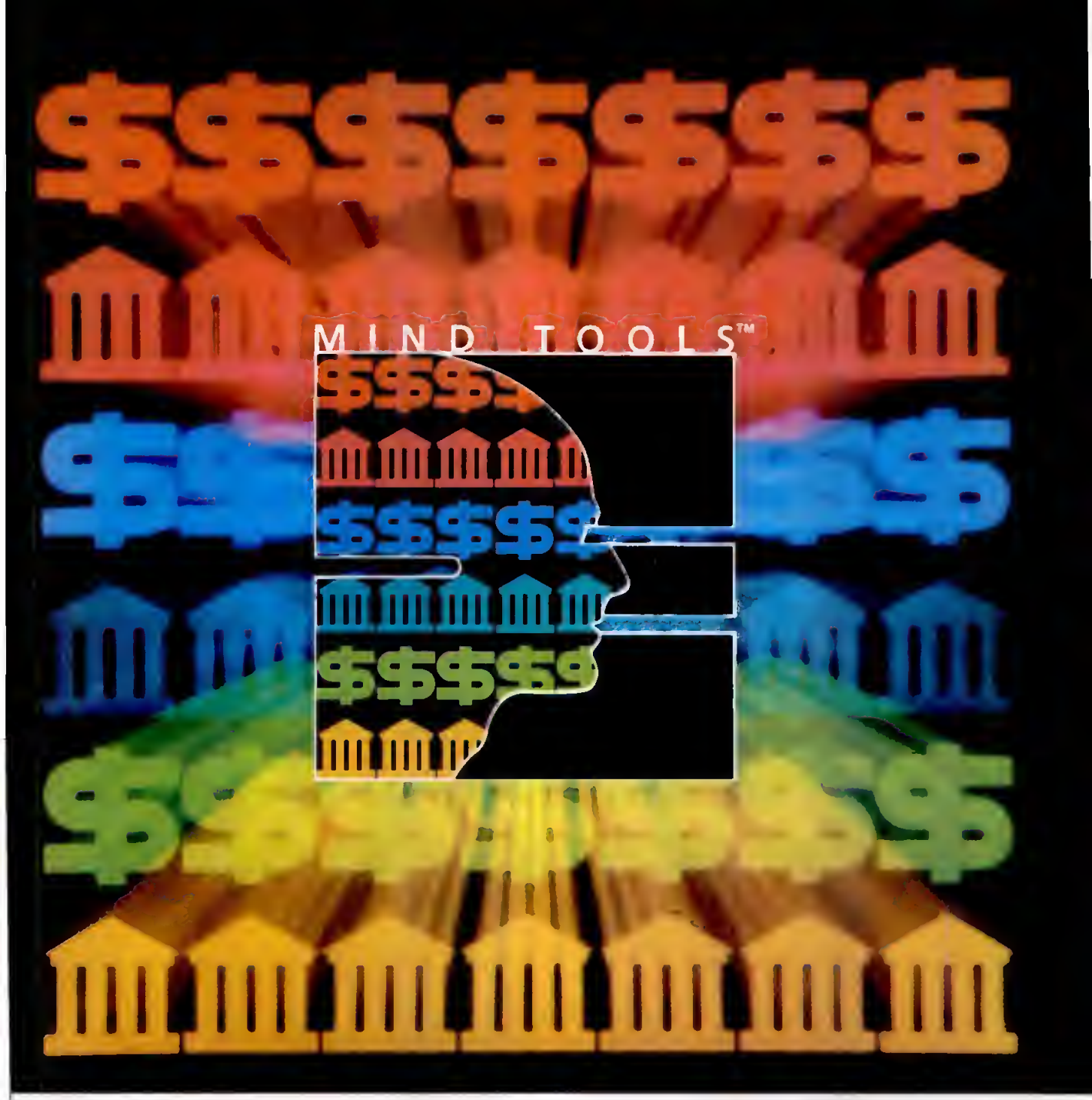
One of the things e player will quickly tire of is the length of time the program tekes to shuffle end deal. It's not as bad as in a real gama, but 30 seconds of waiting aftar 30 seconds of play means that at timas tha playar and tha computer are on a par when it comes to tha clock. Thera are ways around the dalay, but instaad of programming out the difficulty, PS Software has elected to let tha player teke the penalty.

There is a "hint" key, but all the hint does in the section on opaning bids is tall what the computer would do. It doas not tall why the perticular action is suggested, so its value is limited. The "hint" is halpful in subsequant sections whan tha playar can at laast try the play the way the computar recommands it and saa the avolution at the end when the other cards ere visible.

Documentation

Bridge Bidder is not copy-protected. The 22-page menual is computar-printad. Instructions are given for loading the necessery DOS and BASIC but not for copying them onto the program itself for eesier access in a shorter time.

A monochroma screen is all that is needed since the program does not use color. A printar is optionel, depending on whather or not the player wants to make hard copies of the completed hands for



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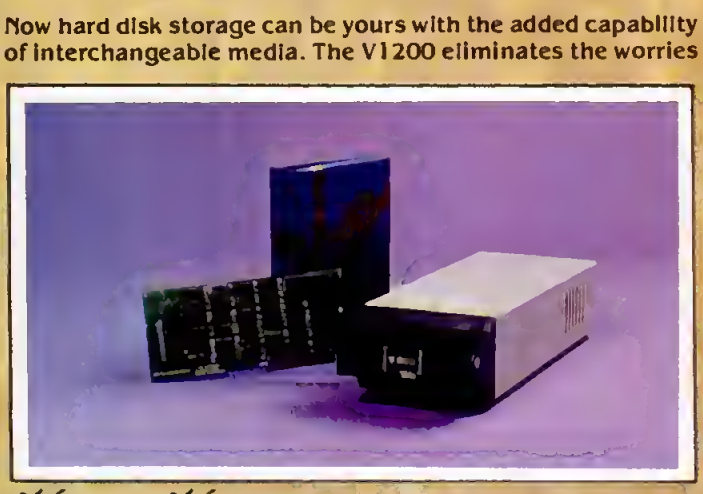

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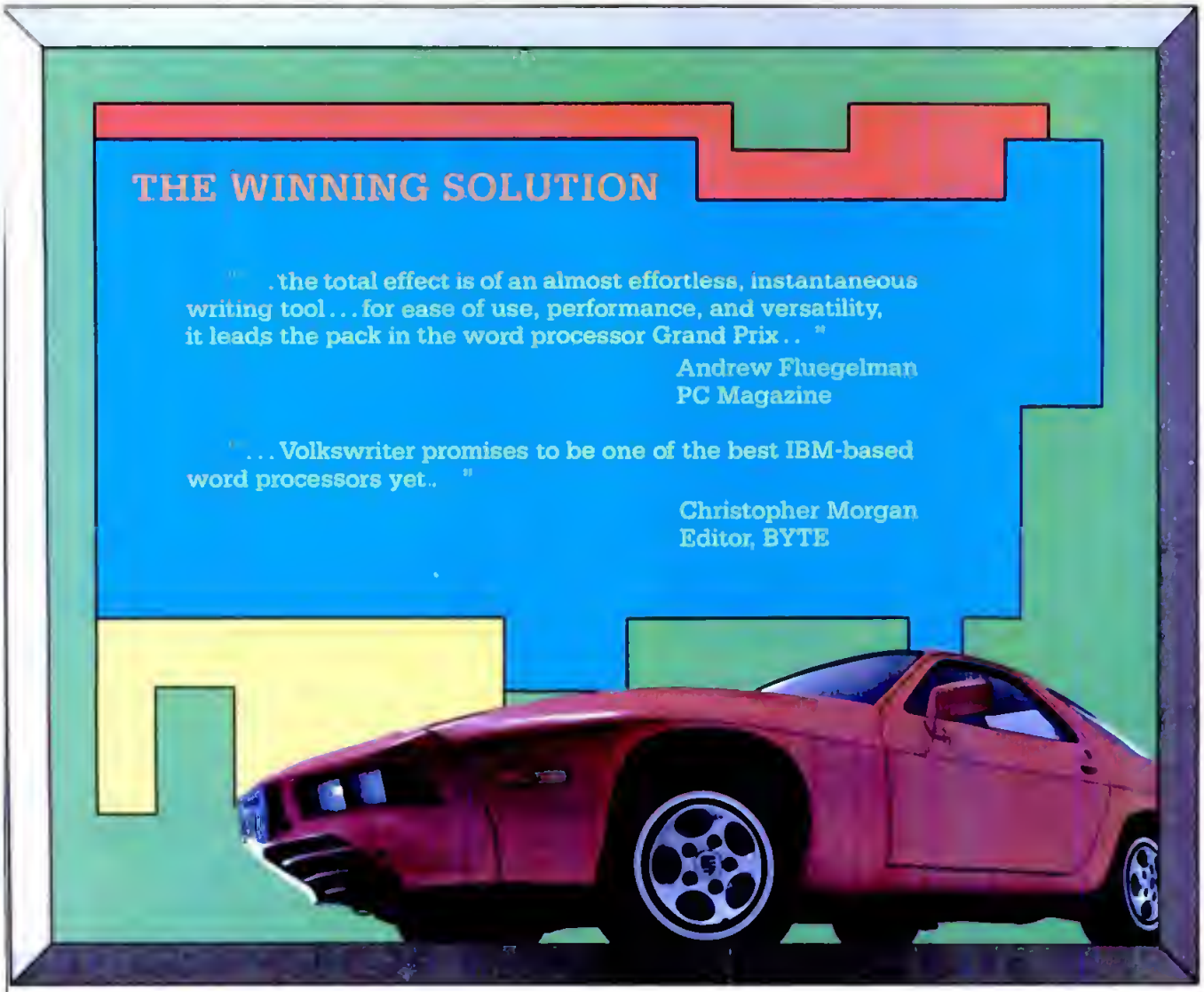

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CIRCLE 423 ON READER SERVICE CARD

latar study.

The first two lessons are for rank beginners who have only heard tha word "bridge". The other lessons are for more experienced players who will find the antire program easy to deal with but not as accurate as one might want.

The manual is readar-friendly, tha program is user-friendly, but a bridge-playing human friend will be needed at some point or anothar. Take heart. There are lots of bridge players around and most of them are eager to welcome a novica to the ranks.

THE BRIDGE Bidder is up against stiff competition from the nonelectronic field of bridge-learning aids.

Player Problems

The program usually bids correctly, but there is no excuse for its occasional illegal bid. In one hand, for example, one spade was bid in response to two clubs. This is illegal since, as at an auction, the bids have to go higher each time.

In another example, Wast illegally doublad partner East's double. Evan worsa, East doublad again. Such mistakas maka it hard for a nawcomar who has to rely on tha teacher's word.

The Bridge Bidder is up against stiff competition from the nonelactronic fiald of bridga-learning aids that do not make mistakes as oftan and are much cheaper.

Basically, tha Bridge Bidder is on tha right track, but the train has not yet arrived at its destination.

The main problem is that the program badly misleads players about 10 percent of tha tima.

Tha program makes a valiant attempt to teach the beginner how to bid, but the rules and convantions of bridga, which must be followed carefully, make this difficult. There's no room—not even 10 percent—for confusion.

Bridga bidding is not something most people learn in a day. The Bridge Bidder doas start beginners on the way, but more advancad playars may have reservations about tha program's value for them.

THE STUD POKER PARLOR
QSI Software
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Anchorage, AK 99501
(907) 265-8187
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Requires: 64K, one disk drive

CIRCLE 607 ON READER SERVICE CARD

The Stud Poker Porlor simulatas real playing action between the computer and the player in fiva- or sevan-card action.

Tha screen displays the hands held by both players. The hands are easy to read sinca each suit occupies a saparata column. This means that cards in the same suit stand out clearly. There is no problem telling a heart from a diamond.

The screen options allow the player to easily pick the computer's skill leval (novice, avarage, or advanced) and playing style (aggressive, conservative, or in between). The player chooses whether a beep will be used to mark invalid entries, which charactar line width (40 or 80) to use, and if tha play will be in color or monochrome.

The next choices are for five- or savencard stud, the bankroll (up to $99,999,999 on an 80-column screen), the pot limit (if ona is wantad), the ante, the maximum bat, and tha maximum number of raises.

Shuffle, Deal, and Bet

Hitting F-6 at any time providas a reviaw of tha ranking of poker hands from highast to lowast and thair charactaristics. This is a helpful aid for beginnars.

Tha playing screen is dividad into four araas. Tha first saveral lines are usad for massages that indicate if a naw hand or game is to be started, if a showdown is coming, if an error was made, and who won if naither player folded.

The second area of the screen shows both hands. Tha computer's hola cards (cards dealt facadown) are not displayad unlass a showdown takas placa.

Tha third area, below the hands, shows tha ongoing batting, raising and folding. The fourth area of the screan shows the currant contents of the pot, aach playar's

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current bankroll, and the number of the hand being played. This area also shows the maximum bet and raises and the pot limit if one has been set.

The status area at the bottom of the screen tells what the computer is currently doing, such as shuffling, dealing, looking (to see who plays first), deciding on a bet, or waiting for a play.

The play is very simple and fast. Commands are single keystrokes and the function keys are used to good advantage. The enter key, which the manual describes as the one "with the bent arrow above the PrtSc key," enters the player's choices. Instructions as clear as this should give users a feeling of confidence.

The Stud Poker Parlor is not copy-protected. The manual gives clear and complete instructions for adding DOS, BASIC and the Stud Poker Parlor game on either a single- or two-drive system. The job takes about 5 minutes and the original game disk becomes the backup copy.

QSI Software plans to change its 11-page, computer-printed advance manual to the smaller format of the IBM manual. Hints on playing strategy are not included in the current manual.

Calling A Bluff

The Stud Poker Parlor promises a challenge for both the beginner and the advanced player. It delivers on that promise.

Bluffing is still part of the game, but remember the computer learns a player's style and adjusts for it. After all, no computer wants to lose all the time.

THE STUD Poker Parlor promises a challenge. It delivers on that promise.

I acted the part of a timid player by folding early for several hands. On the next hand, despite a winning pair showing, the computer tried to bluff outrageously. After that hand, the computer learned it was not possible to bluff all the time and adjusted its playing style accordingly.

As in a real game, a fold means the opponent does not have to show the cards. One flaw is the computer does show its losing hand when it is the caller. No real poker player would do that.

Colors And Strategy

Problems are few in the Stud Poker Parlor and not that important in a game that delivers on intelligent playing action, adjusts for the user's style and is fast. It should be mentioned, however, that readability in the color option depends on the type of monitor used. On some, the screen is illegible. The manual says an RGB display monitor gives the best color results.

READABILITY in the color option depends on the type of monitor used.

The color does not add measurably to the game, but it is available if you like the extra blue, green, and pink and are willing to make a trade-off in readability for it. The 40-column monochrome display is very crisp.

At times it would have been nice to be able to deal the same hand over and see what a change in playing strategy did, but that would not be real poker and this game is best at simulating the real playing situation.

Stud Poker Parlor is a nice package. It anticipates user questions and answers them simply and clearly. There is excellent screen readability on the 40-column width and the action is fast-paced. The program takes only a few seconds to shuffle and deal; waiting is very minimal.

A player does have to be familiar with basic terms such as "fold," but most of these are covered in the manual. The program never takes the money and runs. It keeps track of the betting and does not cheat.

There's no razzle-dazzle here or fancy sounds and graphics as in some of the other card simulation games on the market. There's just good, solid stud-poker playing at a modest price. */PC*

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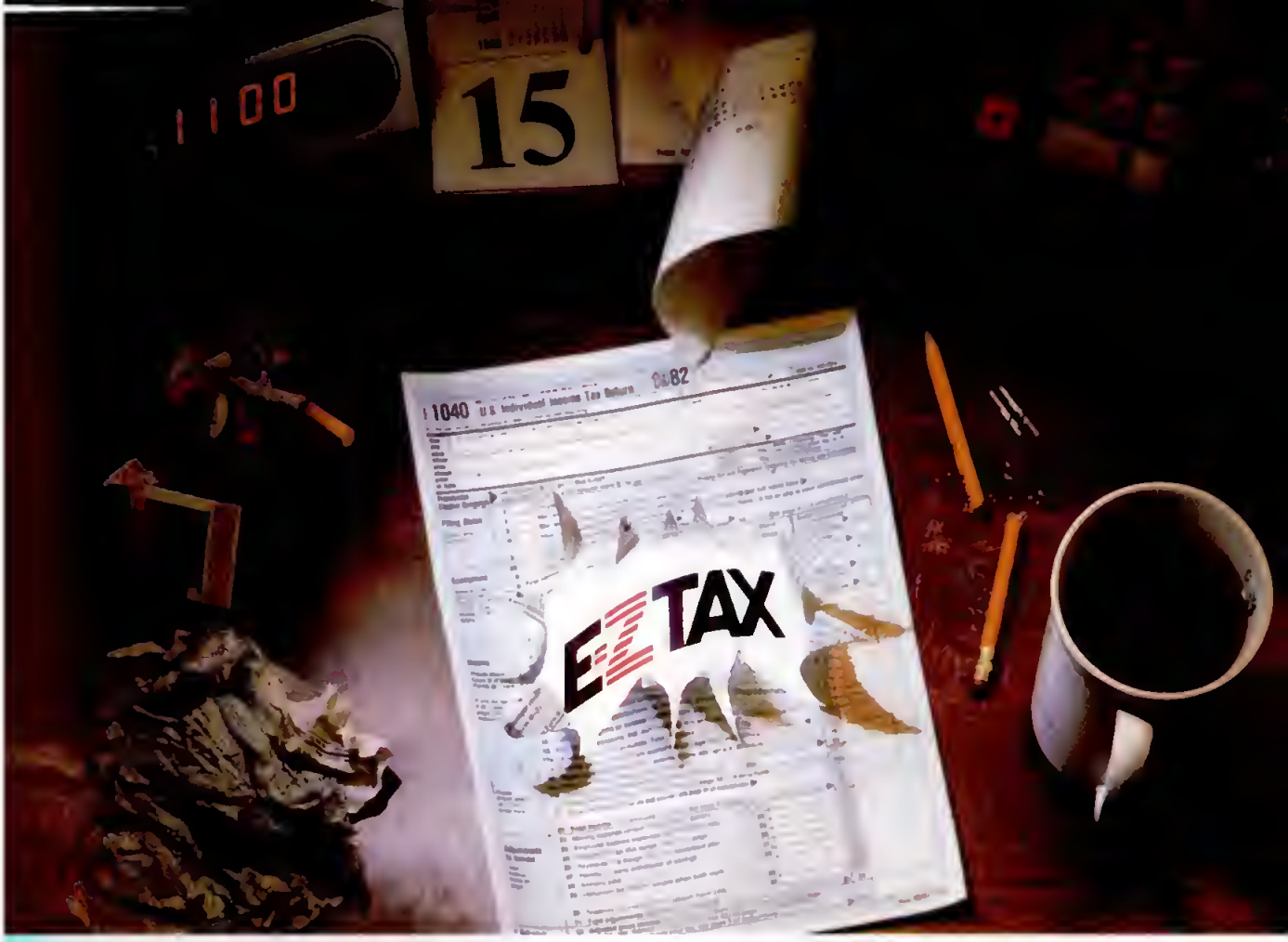

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CIRCLE 240 ON READER SERVICE CARD

Just because you have a PC, don't throw out your appointments calendar just yet; you may regret it.

LOOK BEFORE YOU WEEP: FIVE TIME MANAGEMENT PROGRAMS TO AVOID

Try this simple test: insert one ripe benena, one-helf cup of plein yogurt, and one teble-spoon of honey into drive A of your PC. Type Diskcopy. Do not be alarmed if you get an error message: simply type R untll the drink is smooth and creemy. Gently tip the system unit and pour the contents of drive A into a well-chilled gless. Enjoy.

Does your drink taste e little funny? Do you keep receiving Disk Read Errors from Drive A? You have just learned a veluable lesson: a computer is not e blender.

Computers ere multi-purpose me-chines, but they're not ell-purpose. You cen use one to pound nails, but you'd be e lot better off with e hammer. A computer is not a toaster, and it's not e snow shovel. And after working with five "time man-agement" programs, I've discovered thet it's not the world's greatest datebook either.

Suppose you heve e client on the line. This illustrious gentlemen is willing to let you present your state-of-the-art cheese inventory software. Are you free a week from Tuesday et ten?

"I'll check the computer," you tell him proudly, reminding him that you know your wey eround in the world of the byte. You seve the file you're working on, take the disks out of the drives, end search for the jeckets, which seem to have disep-peared. Well, you'll just swap them with the ones for Time Saver.

But where did you put the Time Sover disk? Aha! There! While you're booting it, you look frantically for the data disk that goes with it. You seem to heve misfiled it under the Limburger eccount.

Now ell you heve to do is enter TS, weit for the program to loed, and type in today's date and time—which you have to check your watch to find out. For some reeson, the progrem isn't eble to pick it up from DOS.

A calender comes up on the screen. You discover that e week from Tuesdey occurs next month. You type F for for-werd, get next month's calendar, move the cursor to the first Tuesdey, press the Enter key, end presto!—there's your appoint-ment schedule. Unfortunetely, you ere spending Tuesdey et en industry seminer. With e mere dozen keystrokes, you use the search function to find out when you're free. Since it insists that you heve lunch from noon to one every day, the first aveil-eble 2-hour slot it finds is 3 weeks from Wednesdey. Maybe you'd better esk your client when he's availeble.

Too lete. The line is deed. Your client is a busy men. You wonder how you're going to explain to him ebout all the time he will save by putting his inventory on

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CIRCLE 252 ON READER SERVICE CARD

the computer. You begin to think Time Sover should be called "Day-At-A-Glance-After-Forty-Keystrokes-And-Ten-Screen-Rewrites."

That's why the term "time management" is one of the most infelicitous phrases since "word processing." These programs are simply glorified appointment calendars. Are they worth the money and the trouble? Well, don't chuck your datebook into the wastebasket just yet.

Time Manager
Miscrosoft, Inc.
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P.O. Box 1328-C
Boca Raton, FL 33432
List Price: $100
Requires: 64K, PC-DOS, one disk drive.

CIRCLE 606 ON READER SERVICE CARD

IBM's Time Monoger (produced by Microsoft, Inc.) is without question the class act of this bunch. It allows you to set up a disk containing an appointment calendar for an entire year and enter just about anything you wish on each line. Math and search capabilities let you do complex expense and billing breakouts. IBM, however, claims that "Most people can learn to use Time Monoger effectively within a short time, usually within an hour." Don't bet your monochrome display on it.

Time Monoger requires a 64K machine with PC-DOS and one disk drive, and supports either 40- or 80-column displays.

A COMPUTER is not a blender.

Using 80 columns and putting a whole year's worth of data on one disk, you're limited to 192 entries per month; you can write 256 entries per month on a disk formatted for half a year. In 40-column mode, these numbers double. Each 80-column entry can include up to 62 characters of text (30 in the 40-column version), and multi-line entries are possible. Using double-sided drives does not increase capacity; a shame, since the extra storage might well come in handy.

Reading the Calendar

First, Time Monoger displays an on-screen calendar for the current month. A date in inverse video has at least one calendar entry connected to it; the others have none. You use the cursor keys to move a pointer around the calendar. Sending the pointer up or down the screen takes you to the previous month or to the following month. You can also change the month by using the PgUp and PgDn keys or by entering the month's number. The calendars run from 1901 through 2155.

Positioning the pointer at a particular day of the month and hitting the Enter key brings forth the calendar page for that day. At this "day level," you can quickly move forward or backward. For example, the tab key will take you to the next date that contains at least one entry; the backtab will go to the previous date with an entry.

Priority Levels

Entries must be assigned to one of four priority levels. Starred (*) items indicate the entries of greatest importance; they appear at the top of the current day's schedule, and they continue to appear each day until you mark them complete or

THOUGH speed seems to be a distinct advantage in a time management program, it can also be a disadvantage.

delete them. "A" items are appointments; they are sorted according to the time of day. Items with 2, 1, and N (note) priority appear on the calendar in descending order. Within each priority level, appointments are sorted by category.

The 26 categories, one for each letter of the alphabet, have already been titled, but

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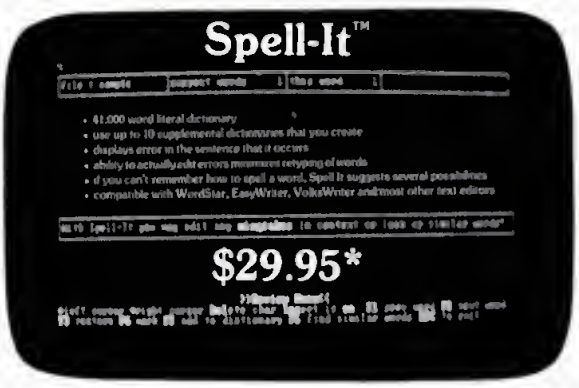

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CIRCLE 146 ON READER SERVICE CARD

you can change their names to suit your needs. You may also mark a special entry such as a birthday or an enniversary "permanant," which makes it easy to retain on e subsequent year's disk. There are two ways to do this, but unfortunataly, naithar one is documented on the help screens or on tha quick reference card. Jotting the procadures down on the cerd will seve you from constantly searching through the poorly indexed menual.

Entering Text

Tha rest of en entry line is devoted to your taxt, which can include just about anything you want. A line editor allows you to delete itams as they are taken care of, or "cross them out" to retain e completa record of your activities. To insert taxt, howavar, you must use the insert key to fill an area with spaces, then type over the speces. In addition, you cen move end copy entries from one dey to enother, end a forgiving buffer lets you undo deletions. You cen even make entries recur, for axample, avery fourth Wednesday. About the only kind of eppointment heve to copy individually is the "third Tuesday of every month" veriety.

One word of caution: Time Monoger is fost. Though speed seems to be a distinct edvantege in a time menagement program, it can also be e disedvantege. The moment you alter e category or priority code, the entry you're working on is sorted, and it's apt to scoot to another position on the screen. This happens so quickly, it's almost unnoticeable, and since the pointers keep their position above whatever takes the old entry's place, it can lead you to make en eccidentel change in the new entry.

Using the Commands

Most commands are preceded with a slesh. If you type /C and another letter, you can select only entries filed under the category to which the letter corresponds. Typing /L lets you select only the entries above a certain priority. /K lets you search for a kayword or a keyword combination of up to 25 cherecters. Upper end lower case distinctions are mercifully ignored, and you can use question marks (but not esterisks) es wildcards in the same way as in DOS.

To demonstrate how these commands work, let's suppose you want to look for all your dealings with Cheese City. All you have to do is type in /K and Cheese City. Every non-Chaase City appointmant will magically diseppear. To scan forward, press the tab key, and Time Monoger will take you to the next antry that contains Cheese City. To see only your appointments with Cheese City, you can type /L followed by an A, limiting tha seerch still further.

Keep in mind, howavar, that evan though the entry is displeyed in lnvarse video, the fect thet you're in this "llmited mode" cen be eesy to miss. Though you mey think you heve nothing scheduled, you mey actually have a full schadule that just doesn't contain any eppointments with Cheese City.

ANOTHER problem with Time Manager is that it allows no margin for error.

Accounts and Data Formats

Time Manoger gives you nine accounts to play with, and you can call them enything you went. you cen enter es many account items as will fit on each line, and you cen even multiply numeric dete (by integers only) to make an annual projection from the first month's data. Unfortunataly, you have to enter your data in formets such as !100.37, @45.22, &5499, and $56.66, which can be confusing.

To break the coda, consult your PC kayboard. Whenever you went to post e numeric antry to e given account, you must precede it by the symbol directly above tha account number on tha top row of kays. For exampla, $56.66 doas not refer to tha amount of money in your benk account—it simply indicatas thet 56.66 of something is applied to the account num-

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CIRCLE 363 ON READER SERVICE CARD

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NOT ALL DATABASES ARE CREATED EQUAL

In hundreds of personal computer applications, users agree on one thing: there's nothing more aggravating than a database that lacks all the features to do the job that needs to get done.

And of all the database features used by experienced users, none is more often called for than data entry checking.

Why is that so important? Because experienced users know how many aggravating hours they can waste fixing mistakes that their database should have caught.

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ber 4.

Another problem with Time Monoger is that it allows no margin for error. The program will do its computations inaccurately if you enter any non-numeric character (with the exception of a minus sign) immadietaly following the accounting symbol or if you end the numeric entry with a decimal point rather then a digit.

YOU CAN fearlessly move your cursor all over the screen, which is not possible even in WordStar.

Record Keeping

Given the ten accounts end the 26 possible categories, you can pull out all sorts of reports. You can also keep treck of payebles end receivebles for a number of differant subcontractors, or create breakdowns of expenses by category. You can also compute running totals or break out totals for e few days, a month, or e yeer. You cen even use negative numbers, something the manual touts as being useful for keeping accounts payable and eccounts receivable records.

On the other hand, you must remember to clear the eccount registers every time you start a new computetion; this makes the screen of accounts disappear. You mey have to cell the screen up again to make sure you really did clear the totals instead of doing something else. This is easy to forget, e genuine nuisance, but absolutely mendetory if you went your computations to coma out right. It should have been progremmed to be automatic.

Time Monoger gives you six "notepads" (12 in the 40-column version). These are blank screens on which you can write whatever you wish. A powerful full-screen editor is also includad. Although a few of the commends take some getting used to, you can fearlessly move your cursor all over the screan, which is not possible even in Wordstor. In this equivalent of the back of the book you can keep memos, phona numbers, or a list of the abbraviations you usa in your Time Monoger entries.

Time Monoger features two printing functions: Ctrl-P, which is similer to our old friend PrtSc; end e global printing feature, which allows you to do the same sort of keyword, category, and priority salection es in tha rest of the program over any desired range of dates. But egain, the accounting function is rather disappointing. There's no wey to print out accounting informetion excapt by tha Ctrl-P mathod, which generetes e very nice-looking report that unfortunately includas a bunch of irrelevent prompts at the bottom.

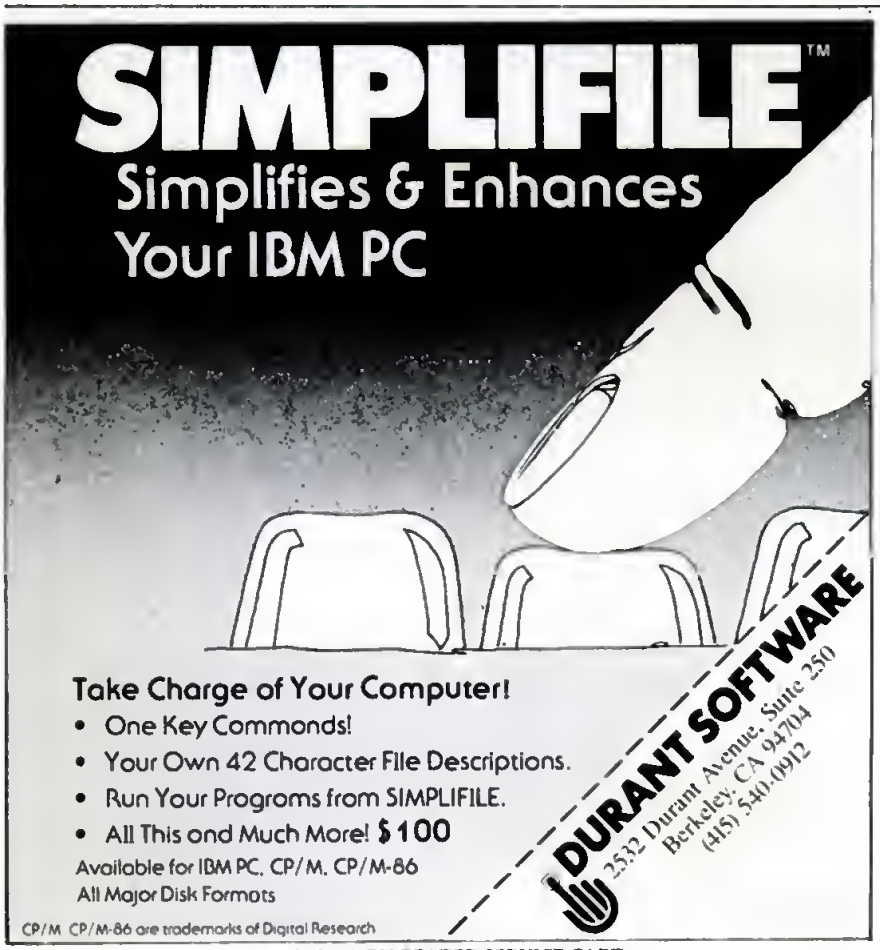
Time Monoger almost lltarally comes with bells and whistles. Every time you move from ona day to the next, you haer e tone that gets higher and highar as you mova forwerd through tha month. Some users may be tamptad to try playing "The Dence of tha Hours," "Tima on My Hands," or "September Song." Fortunately, this feature can be disebled. So can the buzzer, an alarm that goes off at a certein time each day and keeps beeping until you tell it to stop.

Time Monoger can compute the numbar of days between two dates. It can find out what the dete will be 50 weeks from now. And it will let you maka multi-line entries, though nothing beyond lina one will show up in a keyword search.

Keyboard Snafus

Other quibbles? A few. Soma of tha keys are not consistent. The Escape key, for example, usually saves your work and returns you to the previous level. But from the line editor, this key tekes you back to the previous level without saving anything. The space bar sometimes works normally and somatimes sends you into an editing moda. The function keys ere not assigned logically, and neither tha onscreen help menus nor the reference card displays tham in a rationel order. Thara is also a lack of support for double-sided drives.

The nicely printed, IBM-boxed-and-



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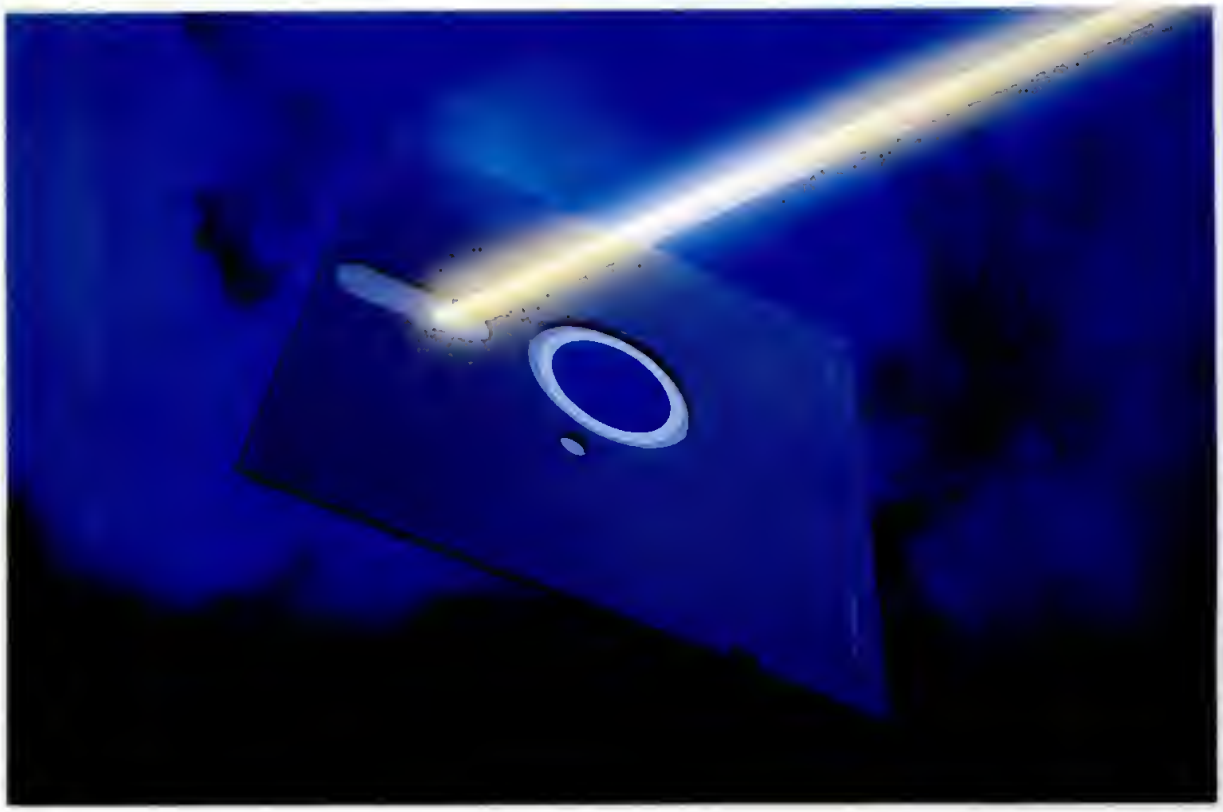

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ring-bound manual is not a model of organization, and the index is less than helpful. From the dncumentation, I am still not positive that I know when the program has saved new entries to disk. And did you know that your PC has a "load lever"? That's what the manual calls the hunk of metal at the front of your disk drives. You probably refer to it as a "door."

There's also IBM's notnrious snftware support, that includes no address or phone number for help but advises you to "consult your authorized IBM Personal Computer dealer." Companies generally provide hot lines for two reasons: first, to help people out, and second, to find out what needs fixing. IBM's misguided policy misses on both counts. Unfortunately, if you've gnt a problem you can't solve by reading the manual, chances are that your authorized dealer won't be able to solve it either. Still, the online help and reference card will get you out of most jams. A disk contains examples that are referred to in the text, giving you a real feel for how the program works. Error trapping is good (I couldn't cause any program crashes); operation is speedy; and despite my annoyance with the manual, its biggest drawback is a lack of information on how to stop using the program.

So why, aside from my quibbles with the program, won't I be using Time Monoger? In two words: copy protection. According to the instructions, you may make only one cnpy of your program disk, a procedure that requires nine disk swaps (even on a 320K system) since it must be completed on only one drive. When you keep getting the same prompts over and over and the manual has given you no clues as to hnw lnng the normally simple process is suppnsed to take, you can be excused for thinking something is dreadfully wrong. It is, but only with the dimbulbs who dreamed up this scheme.

I am told by someone who tried it that failure to adhere to the copying procedures in the manual can turn your master disk to gibberish. That master disk, incidentally, doesn't even have a hub ring. And I wonder what happens with a copy-once disk if you should try to copy it onto a brand-new disk with a couple of bad sectors. Three loud Brnnx cheers to IBM for this policy.

And a fourth, fifth and sixth for doing it on this particular program. Unless it's ready to go at the tnuch of a couple of keys,

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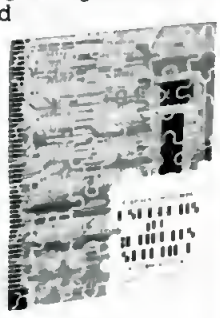

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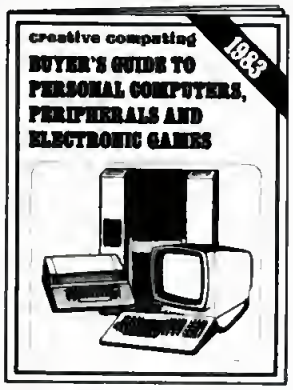

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a program like Time Monoger is nigh unto worthless. If I could leave it onlina in my RAM disk emulator (or on a hard disk if I had one), it might be very handy indeed. But I can't.

Even if I could, it wouldn't help all that much. The only way I can find to axit the program and get back into DOS is to do a full three-key resat. This is another fundamental design flaw that sabotages what is otherwise a rathar nice piece of software.

FAILURE TO adhere to the copying procedures in the manual can turn your master disk to gibberish.

If I had to hazard a guess, I'd suspect this program will eventually be available in a version that will work as an Integrated unit with Microsoft's Multiplon and its long-rumored *Multiword*. Right now, it's on its own, aloof and haughty as a dethroned monarch.

Personal Datebook
Organic Software
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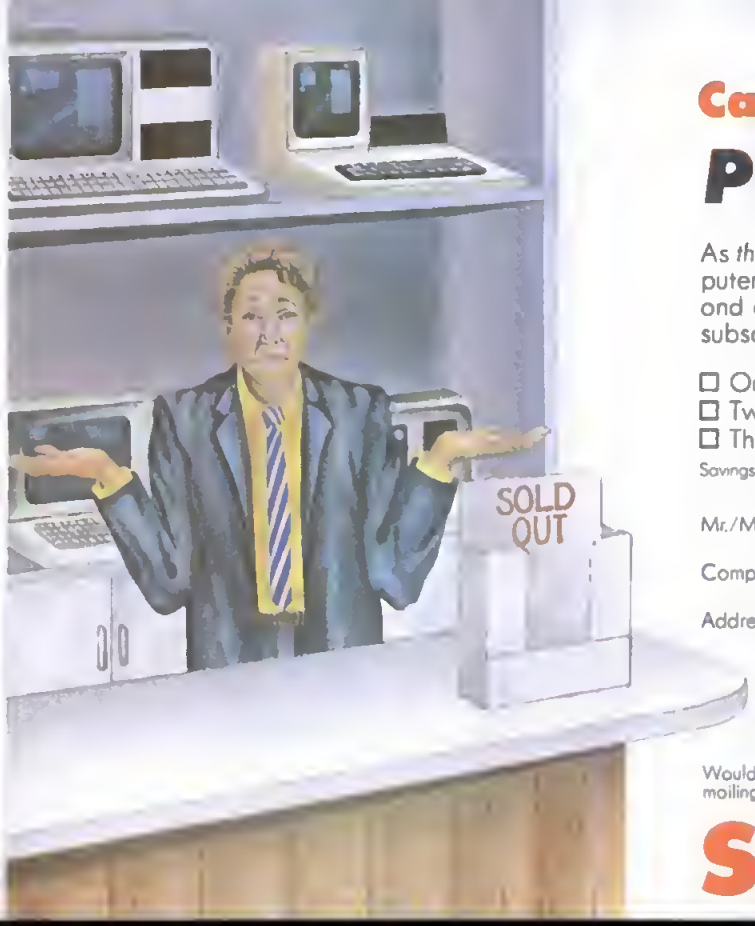
Personal Datebook

One thing *Time Monoger* won't do is automatically avoid schedule conflicts or search your schedule to see when you've got a free 2-hour time slot. To gat your machine to do this, you need a program like Personol Dotebook.

Personol Dotebook is designed to let you find open appointment slots in a calendar. It can examine a group of schedules to find out who's free for a conference, print out calendars for a given period, and conduct searches to find out when a car-



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tain client has appointments scheduled. On the other hand, Personol Dotebook has none of the math functions of Time Monoger; it can't handle untimed items such as "memory joggers," birthdays, or general reminders, and it won't do multiple entrias automatically.

Accidents Will Happen

Personol Dotebook runs from CP/M-86, but it's been brought over from the 8-bit world without much special consideration. For axampla files are referred to by a COM extension in the documentation, but called CMD on the disk. The manual makes no reference to the PC (or even to CP/M-86), and the only PC-specific item is a selection on the installation menu. Worse, the program neither uses nor disablas the IBM function keys. These keys simply put out the same strings of characters as thay do in CP/M-86 command level. An accidental brush of the F6 key causes Personol Dotebook to axamine every character in the string pip b:a:*.*[v]. Needless to say, this can lead to unfortunate accidental commands.

PERSONAL Datebook is designed to let you find open appointment slots in a calendar.

Worse still, the cursor keys in CP/M-86 have been assigned a peculiar set of control characters and symbols, making it possible to exit the program with one accidental keystroke. Since the cursors are totally uselass for data entry within the program they and the function keys should have been disabled. Anyone using Personol Dotebook on a PC would be well advisad to shift the Num Lock before proceeding.

Personol Dotebook works with a 12-hour day, if, for example, you set the first hour for 7 a.m., your scheduled appointments must end at 7 p.m. Don't plan on using this program to list your dinner engagements or your hot dates, unless they occur during working hours.

Scheduling

With Personol Dotebook, you can store schedules for up to nine people, but the more schadules you entar, the lass storage per person. By my calculation, with a schedule for nine people, you would be limited to a range of about 28 days, with a total of 120 appointments per person on a 320K RAM system. With ona parson, you could schedule up to 168 days, with a total of 2,000 appointments. If you have many short appointments (such as a visit to the dentist's office), you can decraase the time range; but once you've chosen it (by using a formula or a graph provided in the manual), you can't change it.

A data disk must be installed for each person whose schedules will appear on it. Among the items you must salect are tha beginning hour of the day and the time interval—10, 15, 20, or 30 minutes. You also choose your days off and your lunch hour. Again, none of this may be altered once you have begun entering data.

"Because computer hardware sometimes fails," says the manual, "there is a small chance that you will losa track of some appointments." To avoid this, you can keep a log of new entries and changes either on tha printar or on disk—but not on both. If you choose the printer as the logging device, it must be turned on whanever you're working with Personol Dotebook, and it will spit out a line of typa each time you make an entry, evan when you do it by accident.

IF YOU SET the first hour for 7 a.m., your scheduled appointments must end at 7 p.m.

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appointments. You have the option of printing these out before the erasure is performed. This is an advisable procedure because there's no other way to keep a permanent record of past appointments.

You can work with only one person's schedules at a time. After selecting the schedules you want to see, you get a two-column list of today's appointments with a space for each interval. You probably won't be able to see the whole day, but you can change the starting hour of the display. Unfortunately, there isn't much room for each entry, since you're limited to 20 characters per name and 30 characters per time slot. That may be fine for longer appointments, but it's a potential problem for shorter ones.

You can move to another day's schedule by entering either a new date or a command such as +5d (forward 5 days). Since the N key also takes you to the next day, you could hit it five times to go forward 5 days. This would not be a good idea, however, because the program would rewrite the screen five times. Screen rewriting takes about 7 seconds—nearly twice as long as it takes with WordStor.

For some reason, writers of time management programs seem to want to revolutionize the process of data entry. In *Personal Datebook*, there's usually some sort of entry already in every data field, often (but not always) the last item you worked with. Therefore, you may feel that you're always correcting data rather than entering it. When you type your first new character in an alphabetic field, the old entry disappears and the field (in inverse video) widens to show you (via a string of dots) how many characters you may enter. But entering numeric data always involves typing over old stuff. It's extremely irritating, and there's a strong impulse to reach for the cursor keys. Don't.

WITH PERSONAL Datebook you can store schedules for up to nine people but the more schedules you enter the less storage per person.

Finding an Opening

To search for open appointment slots, you must specify the length of time needed, the first and last acceptable days, the acceptable days of the week, and the first and last possible hours. The program then produces a list of openings displayed as a menu. The schedule for the day you select can be accessed with a couple of keystrokes. Overlapping appointments or appointments made on weekends or days off must be confirmed.

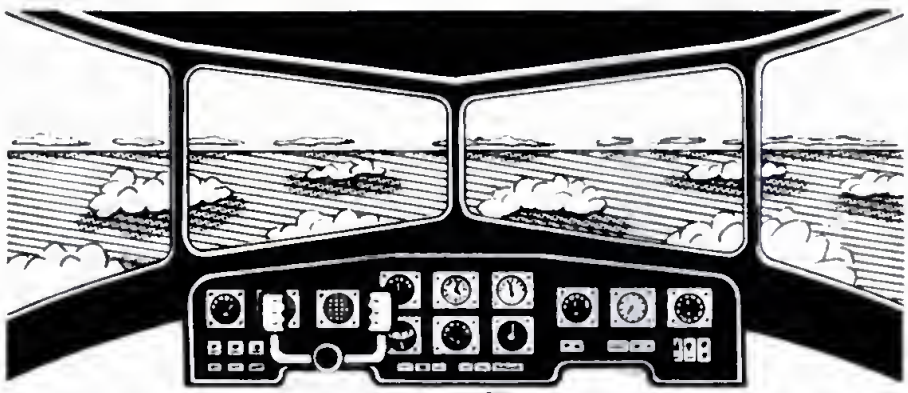
Breaking Appointments

Canceled appointments can be stored in a "reschedule area." There's also a "future list" for appointments scheduled beyond the normal range of the calendar. As the program is updated, appointments on this list move into the current calendar. There's room in this section for only 40 items per schedule.

Appointments for a given day can be printed out with a few simple commands. Though these commands appear in two column on the screen, they are actually printed in only one column. Another option allows you to search for a particular client's appointments. A search for R in a sample file I created produced the files for Dave Jones and John Smith, along with the one entry whose name actually included that letter.

SCREEN rewriting takes about 7 seconds—nearly twice as long as it takes with WordStar.

To schedule conferences, go to the group conference menu and enter the date, time, length, and reason. Then, press E to examine all the files. If everyone is able to attend, press S and schedule a



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CIRCLE 296 ON READER SERVICE CARD

meeting. If not, you are given a message stating the names of the busy parties. You then have the option of including or excluding anyone or changing the time and reexamining the schedules. The program, however, will not search for a time when everyone can meet. The first time I tried it, the program set up a conference on one of the participant's days off.

Man Vs. Machine

Despite the complete omission of information on the CP/M-86 and the PC and the inclusion of irrelevant information concerning UCSD p-system versions, the typewritten, notebook-binder documentation for this program is fairly good and features plenty of sample screens. It does not, however, make up for the problems abounding in the program. For instance, the program can hang without an error message if your printer happens to be off line. When it does give you a printer error message, it's a terse and confusing one from CP/M-86. Though there are always onscreen mini-menus to guide you, the one-stroke commands are inconsistent. An important onscreen installation warning is almost unreadable because it appears partially in Greek and partially in other foreign characters instead of in English. Other onscreen messages are sometimes ambiguous and occasionally incorrect. The disk drives make more of a racket than with any other program I've ever run, and the problems with the cursor and function keys are utterly unforgivable.

In addition, Personol Datebook is slow; frequently, you'll have to wait for menus and screen updates. As a tool it's painfully slow; a good receptionist could scan an "At-a-Glance" calendar and find a line of free space in a five-person office long before this program could. Ultimately I can't envision anyone really saving time by using Personol Datebook instead of a standard calendar.

The manual warns "Never, never turn off your computer without ending Personal Datebook by selecting the Quit option from the group selection menu. Failing to end Personol Datebook this way may lose important information." Would you swear that no one in a busy office would ever decide to help out by turning off a machine because "no one is using it"? Indeed, would you swear that no one would ever hit Ctrl-Break, accidentally; a mistake that aborts the program with equally grim results?

THE DISK drives make more of a racket than with any other program I've ever run.

If you still plan on using this program, you should also plan on dedicating your PC to it during working hours. Why? First of all, people want to know now when they can get an appointment. Second, Personol Datebook can be copied and can probably run from any drive, to use it from MS-DOS you have to exit whatever program you were working with, do a three-key system reset, and boot-up an entirely different operating system. My advice: stick with the $10 "At-a-Glance."

The 25th Hour, 25:01—Time Scheduler/Organizer
Softrend, Inc.
P.O. Box 1462
Charlottesville, VA 22902
(804) 979-8194
List Price: $99

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The 25th Hour, 25:01—Time Scheduler/Orgonizer by Softrend, Inc. sounds like a mouthful, but it has a certain elegance and simplicity. It generates appointment calendars on a 24-hour basis, lets you include untimed information, checks time conflicts, and handles an almost unlimited number of individuals or projects. It can also produce recurring entries, and it will allow you to scan for available time slots within certain limits. You can even enter two advance warning "ticklers" to remind yourself of a forthcoming event.

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- Same string option
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CIRCLE 117 ON READER SERVICE CARD

old files, you can copy a disk for your records before wiping out old data. The screens are laid out cleanly, and the program uses the function keys in an odd but more consistent way than any of the other programs reviewed here. The screen will even tell you what each key does.

25:01 PRINTS out better-looking reports than any of the other programs.

BASIC Problems

Why don't I like this program? One answer is BASIC. Often, everything stops, and 25:01 goes out to get a program segment from disk. This function takes too much time, as do many of the other functions. Each write of a repeating weekly entry takes more than 15 seconds—13 minutes to enter a single weekly event! In addition, there is no way to automatically enter a repeating event that ends before the year—for example, a 10-week-long weekly class.

Want a calendar? Just name your month and year, and onto the screen it comes. But for some reason, each week of the calendar runs from Monday to Sunday rather than from Sunday to Saturday. Though the manual mentions this anomaly it does not explain why.

Like Personal Notebook, 25:01 insists on giving you entry fields to modify, rather than blank spaces to fill up. But at least 25:01 allows you to use the cursor keys.

There is also no way to put a daily schedule on the screen. If you want to see a schedule, you have to get it from your printer. You must also use the printer before you can modify a record. This is necessary because the printer is the only place that contains the record number assigned to an individual entry, and you need this number to call each entry up.

Pluses and Minuses

25:01 prints out better-looking reports than any of the other programs. It will print a daily calendar with every time slot accounted for and every untimed entry listed at the bottom, or it will print a calendar for a given period, with the starting times and ending times of each activity neatly computed. Unfortunately, the record number also appears on each report, and it can't be omitted. Since there is no search function available, you can't call up all your forthcoming appointments, and since there's no math capability, you can't keep a running total of your account.

Though the manual is wordy in some spots and vague in others, it contains many examples. Onscreen messages refer you to the proper section of the manual. Examples even appear on disk, though the manual doesn't give you this useful information. The examples do give you a reasonable idea of the program's capabilities and limitations.

Finally, though 25:01 can be copied and listed (though the program listing has no remarks) and it appears that it can run from any drive, its limitations aren't likely to save you 81 minutes in a day—or in a lifetime.

Agenda
TCI Software
8107 West Mill Road
Fourtown, PA 19031
(215) 836-1408
List Price: $65
Requires: 128K

CIRCLE 603 ON READER SERVICE CARD

Agenda

Agendo, another program written in BASIC, has screens that are as messy as 25:01's are clean. Since the version I received has been compiled (and requires a 128K system), it's reasonably fast. But speed and the ability to get the system time from DOS are about the only good things Agendo has going for it.

Agendo has a mixed bag of features that should be familiar by now. It allows you to make the same kind of entries as the other programs, but gives you only 28 characters of text per entry. It has user-definable expense codes, but it cannot handle any

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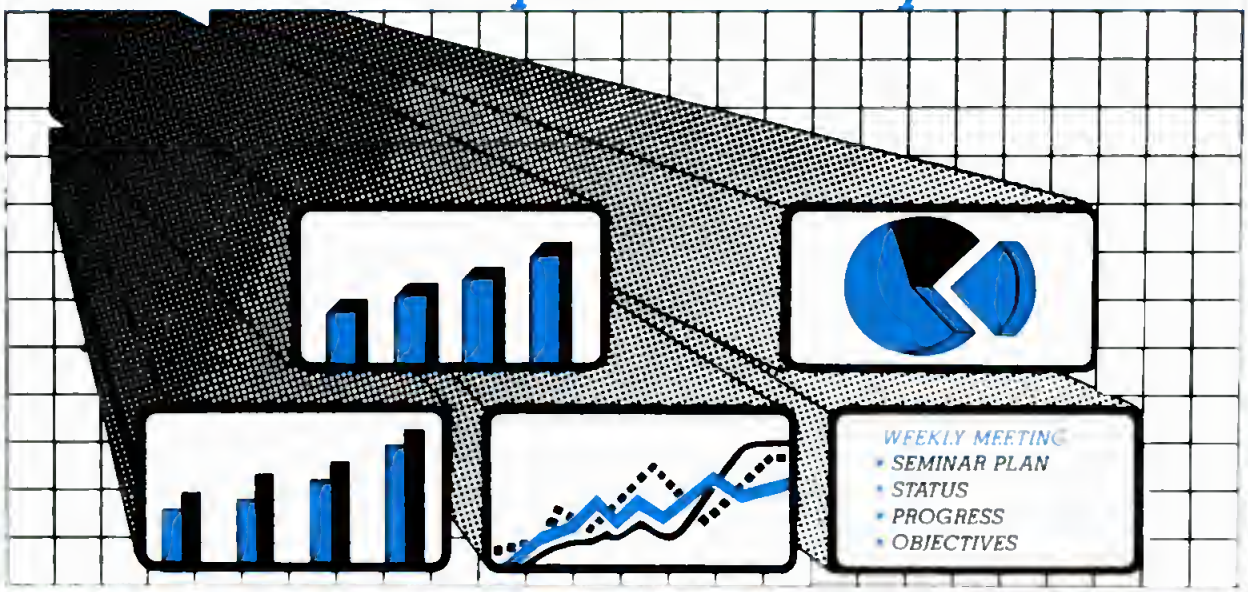

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expense of more then $654. It can do some meth, but seems to be limited to toteling how much you spent on e given dey. You cannot enter expense date elong with the rest of e record; you have to modify the record to do it. Nor cen it do searches, end as with 25:01, there's no wey to terminate recurring entries (monthly and ennuelly only).

AGENDA is a model of sloppy programming.

Sloppy Programming

Agendo is e model of sloppy progremming. It often deposits you in situetions thet don't seem to eilow any greceful wey out. Leeve your printer off line end Agendo quits end drops you back to DOS. Type E, and you are entering dete—except when E means "end dete entry." Type X and you correct e dete entry error—except when X is used to exit the progrem. Some error messages stey on the screen and clutter up the aree where you're supposed to enter deta; others flash by so quickly you can't even reed them. The embiguous "Redo end Stert?" messages from BASIC eppear when you try to enter non-numeric dete in a numeric field.

In the menuel, an extre r is ettached to the end of the word recur whenever it eppears. Colendor is consistently misspelled. The manual offers no edvice whetsoever on whet to do when the dete disk fills up. Agendo does heve one truly unique feeture: the "secret option." By pressing one of the keys you can display the menufacturer's logo on the screen along with e digitel clock. As another consoletion, e pithy epothegm such es Theodore Roosevelt's "90 percent of all wisdom is being wise in time," heads each chapter.

I followed TR's implicit advice and stopped using Agendo.

Personal Secretary
Computer Aided Design
764 24th Avenue
San Francisco, CA 94121
(415) 387-0263
List Price: $54.95
Requires: 64K, two disk drives.

CIRCLE 602 ON READER SERVICE CARD

Personal Secretary

The name Personol Secretory is probably meant to conjure up visions of an efficient eide-de-camp who enticipetes your every need. Ales, Personol Secretory is e cut-rete copy of Time Monoger, with primitive versions of many of its feetures.

You move e cursor around its calendar pege, but the cursor movement hes no logic. You enter and edit dete e line et e time, but you cen't make untimed entries. You get two eccounts to pley with, "Cost" end "Invoice," but when you try to compute a totel, their names become "Reimbursebles" and "Services". You get a lot of 10-second waits, during which the only ectivity on the screen is e blinking cursor. The progrem even forgets the time of dey end demands thet you re-enter it. This is one personal secretary bent on being chief executive officer.

Secretarial Burn-out

The "deysheet" is the list of entries pertaining to e particular dey. Multi-line entries are not allowed, and the program insists on depositing the "system time" on eech new line. This entry elmost elweys hes to be chenged. You can type over it, but you can't backtreck in order to correct errors. You can't always go forward, either, because the cursor and the backspece keys don't elweys work correctly. At least the line editor lets you meke insertions logicelly, though et times, the screen could not keep up with my typing. I still don't know what happened to the cherecters I pushed off the right side of the screen.

Untimed items, such es reminders end generel notes, are e definite problem. The program forces you to supply e time for every entry in the format 00:00 a.m. The menuel claims thet you may enter eny combination of digits in the 00:00 section to orgenize deta in other than temporal sequences. But when I entered 47:46 e.m.,

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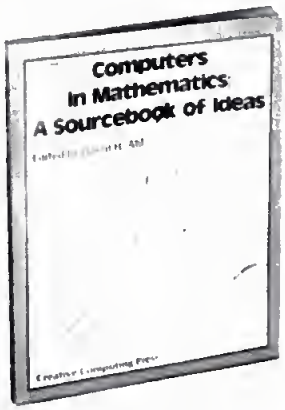

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the program changed it to 35:46 p.m.! Similar results were obtained with other numbers, including one that was changed twice.

PERSONAL

Secretary is a cut-rate copy of Time Manager with primitive versions of many of its features.

Personol Secretory contains a search function, but it only considers identical metches, and it is the only function that works in upper and lower case. You can place a recurring entry on the same day for as many months as you choose, but there's no way of repeating an entry every day, week, or fortnight.

Words of Warning

The documentation for Personal Secretory is dismal. From reading the manual, you can barely figure out what the progrem is supposed to do. The manual does not include a single sample of a screen display or one specific example of data entry. But there is this friendly little note:

> Before you stort, one word of warning. The system must be closed by pressing key F10 every time you exchonge Timefile Diskettes! If you do not do this, the system will not keep track of the correct number of files ond you will need to monuolly repoir the domoge! This will require knowledge of the Disk Operating System.

What knowledge, the manual doesn't say. But roughly translated, if you foul up here even once, you are definitely out of luck.

The makers of Personol Secretory have also conveniently forgotten to list their telephone number. Resourceful complainants will find it listed with San Francisco directory assistance.

I once hired a personal secretary slightly more capeble than this one. I fired her before lunch. **/PC**

Stephen Mones wrote the recent novels Video War (Avon) ond Thot Gome From Outer Space (Dutton).

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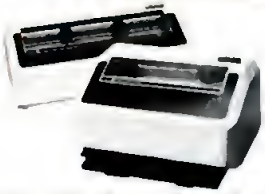

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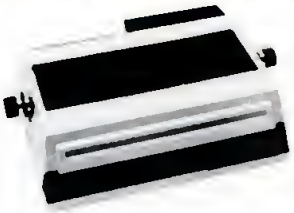

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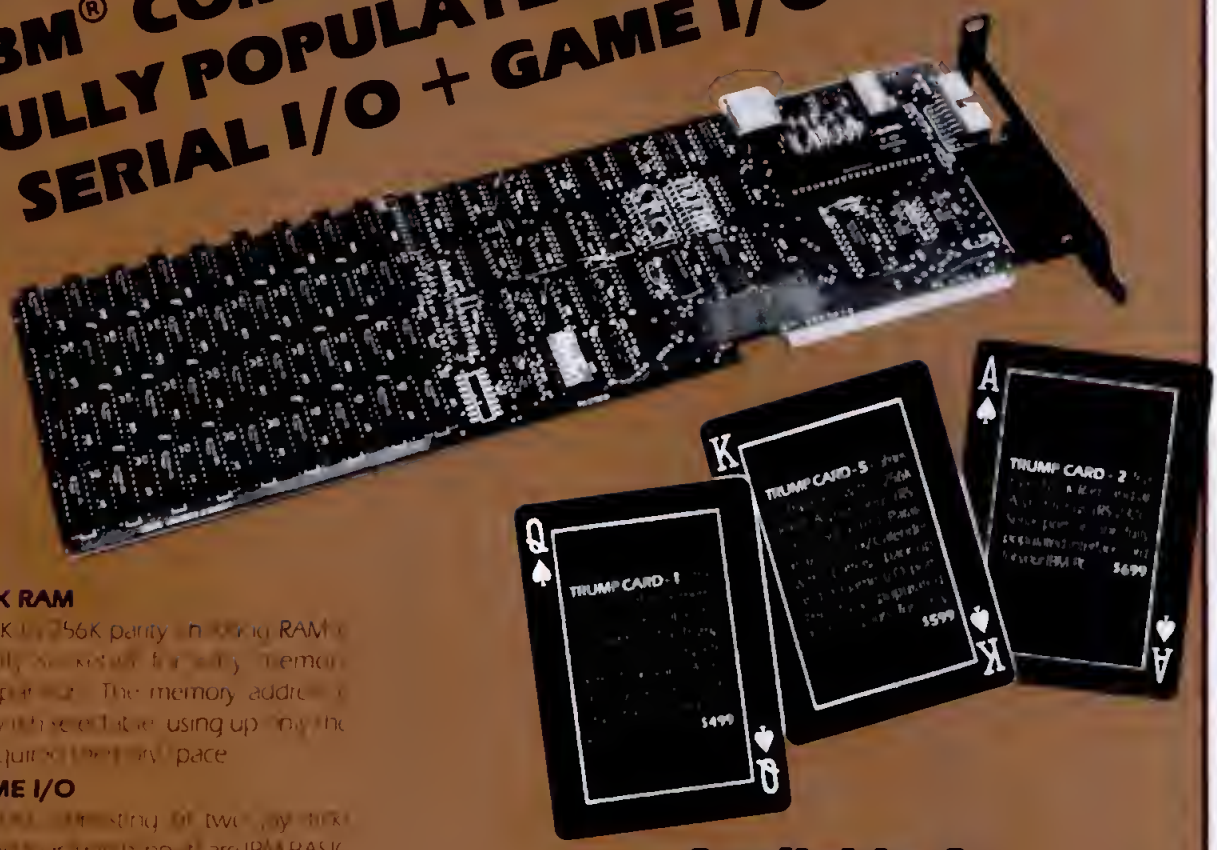

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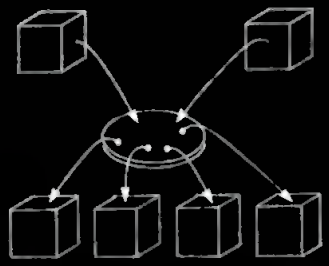

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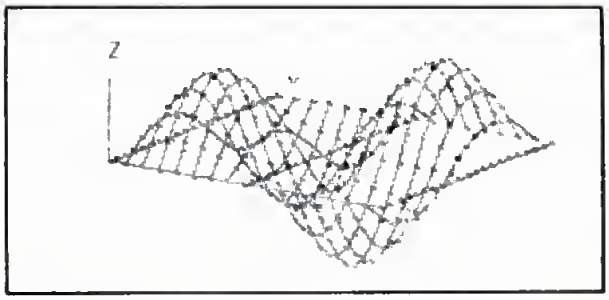
Softkits contain complete, ready-to-run programs. The programs are modular, menu-driven and written in BASICA. They come fully-documented with listings, theory, equations and operating instructions. Use them as-is or modify and combine for custom applications. Softkit disks are copyable.



Data Plotting Software for the IBMpc

This softkit contains a system of 18 complete programs which process and display data: pie charts, bar charts, stock market charts, histograms, 3D views of surfaces, log plots, curve fitting, data management, histograms and statistical analysis.

Programs are modular, menu driven, written in BASICA, fully explained and keyed to theory. They are listed in the book alongside theory and equations. Use as-is or modify to best suit your own applications.

Four data base management programs are included. These create x, x-y, x-y-z and stock market data files and store them on disk. Plotting programs read the data files and carry out sorting, statistical analyses and plot results.

Features include automatic scaling, axis marking and numbering, auto replot when data changes, and a special program called **LABELER** which places text and symbols over graphics using a moving cursor.

☐ **Book with Disk: $48**

Engineering Software for the IBMpc

This softkit contains 25 fully-documented programs for computer-aided design and analysis on the IBMpc. They will show you how to write modern CAD software and use your PC for professional engineering work.

Emphasis is on combining computer graphics with engineering problem solving. Programs are included to interactively create engineering drawings, store them on disk, recall, update, merge, add physical properties such as resistance, thermal capacity and density, and rotate in 3 dimensions to produce isometric views.

After being stored on disk, the drawings may be recalled by applications programs which perform mechanisms simulation, heat transfer, matrix operations and optimization using Monte Carlo techniques. Programs are also included for Fourier Series and Transforms. These graphically display spectra alongside waveforms.

All programs are menu driven, written in BASICA and fully documented and keyed to theory and equations.

☐ **Book with Disk: $48**

IBMpc Graphics

This softkit is a self-teaching guide that will show you how to write your own 2 and 3 dimensional graphics software on the IBMpc, quickly and easily.

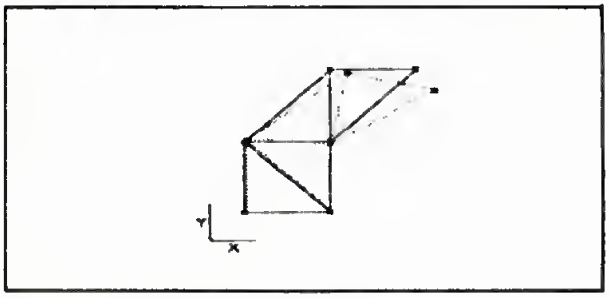
Learn how to create 2D and 3D shapes, translate, rotate, scale, stretch, clip, remove hidden lines, shade, create perspective views, calculate and plot surface intersections, produce animations effects, store graphics on disk.

Applications to science, education and business included. Also covers hardware needed for PC graphics, use of the PC's special graphics enhancements, and how to separate text from graphic on the PC's screen.

Contains 61 programs arranged in a tutorial manner leading from one step to the next. Math level is kept to a minimum and new concept are explained as they are used.

Much of this softkit is based on the popular **Graphic Software for Microcomputers** by B.J. Korites which was named "The Best Book on Microcomputer Graphics" by Creative Computing magazine.

☐ **Book with Disk: $45**



Structural Analysis Software for the IBMpc

These 11 programs will give you the ability to carry out sophisticated structural analyses on your IBMpc. They are modular, fully documented and ready to run.

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Programs also included for analysis of trusses with large deflections and non-linear material properties. These use an incremental solution strategy. Other programs calculate combined stresses and properties of beam cross sections.

Analyses use the modern "direct stiffness" method.

This system of programs is patterned after large-computer structural analysis systems such as ADINA and NASTRAN, but reduced in scale for micros. They were written by B. J. Korites, PhD, former CAD/CAM consultant to the Arthur D. Little Company.

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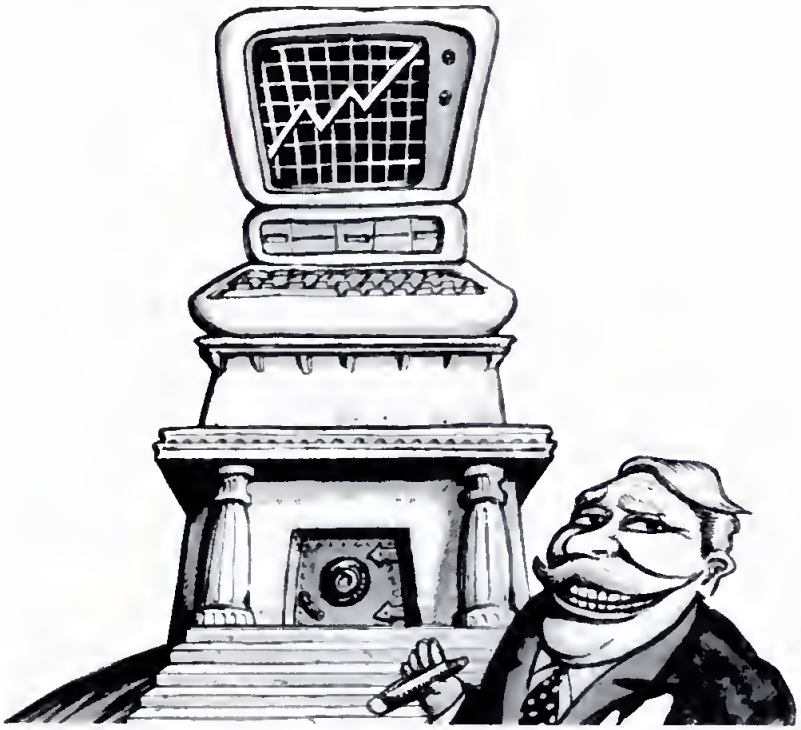
This straightforward, well-conceived graphics and analysis package helps executives plot a course through a sea of numbers.



Beyond The Bottom Line With VisiTrend/Plot

VisiTrend/Plot
VisiCorp
2895 Zanker Rd.
San Jose, CA 95134
(408) 946-9000
List Price: $300
Requires: 128K, one disk drive (two recommended), color graphics adapter, graphics monitor.

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When confronted with e complex spreedsheet, the average executive is apt to make a mad dive for the bottom line.

We ettech e great deal of importance to thet revered figure, but in these modern times of wild business fluctuations, the last line hardly tells the whole story. Though the rest of the story may be there, the seemingly endless rows of numbers can obscure the most vital business information.

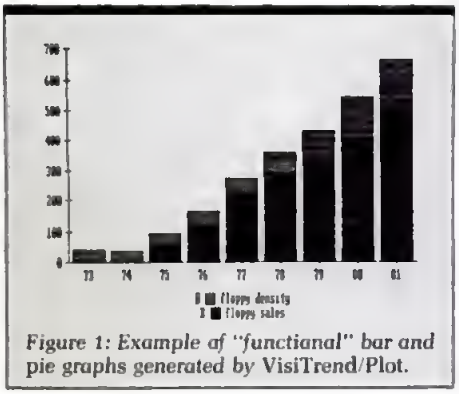
ENDLESS rows of numbers can obscure the most vital business information.

The problem of the hottom-line-bound executive (or any business enalyst) is that he or she may not have time to deal intelligently with e computer-generated list of more numbers then are in a United States census report. Often there is no time to anelyze them to get a true picture, no time to spot trends and flag impending disesters.

The IBM Personal Computer holds the promise of being the executive's dream come true. Not only is it mathemeticelly eble, e genuine 16-hit stetistical whiz, but when properly outfitted with hardware and software, it can reveel the truth in grephic deteil.

The rudiments are there in the form of

Illustration: Don Day



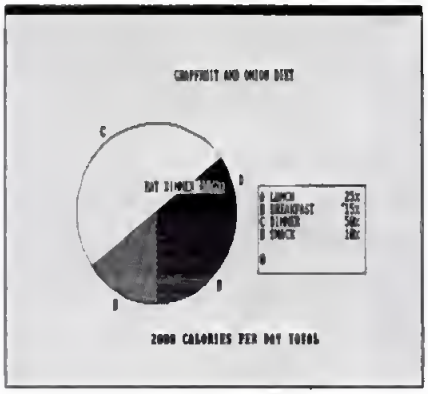


Figure 1: Example of "functional" bar and pie graphs generated by VisiTrend/Plot.

the BASIC graphic commends, but most executives don't have the time (or inclination) to learn enough programming to make the commends useful. Too, progremming requires the ability to find the appropriete formule or elgorithm to solve a problem; for untutored executives this is more difficult than the programming task itself.

Whet the computer-oriented executive needs, therefore, is an eesy-to-use and easy-to-understend business enelyzation and grephics software package.

With the ideel program, the harried businessperson could do the following: dump some numbers in end get en immediate reading of not only a growth trend but of how that growth is changing, compare tbe trend to leading economic indicators or the price of rough-cast doily futures, end get these results not just in vague numbers but in easily-grasped charts.

The Software Solution

One attempt to solve the dilemme, giving executives the software tools they need to enswer methematical problems they can't even write down, has resulted in VisiTrend/Plot.

THE GRAPHICS are more utilitarian than flashy, proven rather than experimental.

This dual-purpose software package can enelyze a series of numbers, such es monthly seles figures, and deduce an average trend revealing growth or decline end how it is changing—hence the "Trend" pert of its name. The same numbers can be used to plot line, bar, or pie charts on the PC's grephics monitor or generate them on peper—hence the "Plot."

And, most appealing to the novice, VisiTrend/Plot does botb without requiring the executive to know how the computer operates or even how to type.

VisiTrend/Plot is e product of VisiCorp, perheps best known for VisiColc, the program credited with having sold more personel computers to business than Charlie Chaplin.

Like its sibling softwere, VisiTrend/Plot is a well-conceived and thoroughly thought-out product aimed et the business executive. it carries much of the Visi-philosopby with it—no frills and no frivolity, just get it done and down in bieck and white.

That's right, I seid "biack end white." Although VisiTrend demands, at minimum, 128K RAM, a color/graphics edepter,. and e grephics-cepable monitor, it views the world through monochrome glesses in bleck end white. (In the business environment, though, it's more likely to be black and green.)

Functions and Applications

The software carries some of the Visireputation with it, too. It is conservetive—the grephics are more utilitarian than flasby, proven rather than experimentel. While these screen imeges are both useful end eble, they are fer from pushing the limits of the PC's grephics cepebilities.

Actuelly, grephics pley a secondary role in the VisiTrend/Plot package: They merely displey the results and meening of the program's sophisticeted methemeticel manipuletions.

The real power of VisiTrend/Plot, and its reei veiue to the executive, is its easy-to-use statistical anelysis tools. (These tools can be belpful in many scientific epplications, as well.)

After a little training you can teke a series of values—from monthly sales to stock market prices to calorie intake—and use e few keystrokes to determine the change between eacb value, calculate a moving everage over multiple months, determine the correletions between seles and profits et various levels of volume, compute e multiple regression equation to determine a streight-line business trend, sbift periods for purposes of comparison, compute running totels, end even compute your own statistical trensformations using your secret supply of magic formulas.

After you've completed the statistical menipuletions, the "Plot" part of the progrem draws line, bar, or pie charts of your results. If you wish, you can graph your rew data without manipulating it further.

COMPUTE YOUR own statistical transformations using your secret stock of magic formulas.

The program's uses are limited only by your imeginetion in appiying statistics to your business.

VisiTrend/Plot will quickly draw a seles chert for the last 10 years or plot sales versus profits. But it can also average and smooth out deta to sbow trends cleanly end unambiguously, plot the progress of your favorite stock with e "high-low-close" greph like those in the *Wall Street Journol*, and ellow you to overlay a chart of this year's expenditures on one for the matching period from last year.

Documentation

One of the biggest shortcomings of most programs is their leck of useful documentetion. It's like being turned loose on the interstate bighway system with neither e roedmap nor an owner's manual for your car.

VisiTrend/Plot doesn't cast you adrift. Its 200-pege, loose-leaf manuel both introduces you to the program and serves as a

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helpful reference later on.

The bulk of the manual is a tutorial, laading you step by step through the features of the program. The manual assumes nothing about your knowledge of the PC. In casa you don't know how your keyboard works or what a cursor is, for instance, both are explained.

All instructions are explicit, down to such minute details as how to copy the PC-DOS operating system onto your program disks. Rafarances to the screen are naarly always illustrated with sample displays.

Be warned, however, that although the instructions are easy to follow, you can't expect to be an instant VisiTrend/Plot expert. Just walking through the tutorial may take a whole working day or a lamp's worth of midnight oil.

THE BULK of the manual is a tutorial.

For impatient users who believe that "when all else fails, it's time to look at tha manual," the tutorial lists a summary of keyboard commands and functions after each chapter, and the manual's reference section describes each available function by name and talls how each ona works.

The manual includes several appendices: a full explanation of all arror massages, including what to do when you run into them, interface information for the handful of printers compatibla with the program, explanations of fila formats, and a glossary.

Although the manual doas maka a token effort to indicate what all the available statistical oparations and analyzation techniques might be used for, applications information is rather scanty. You're laft with the reassuring notion that VisiTrend/Plot will computa the Sum of Squared Residuals, the Standard Error of Regression, the Coefficient of Determination R, tha Corrected Coafficient of Determination R, and tha Durbin-Watson Statistic, but without the slightest hint of what you can do with them all.

VISITREND/PLOT is not designed to give you a full course in statistics.

In other words, although VisiTrend/Plot is a statistical tool, the manual is not designed to give you a graduate course in statistics.

Running the Program

The first stap in running VisiTrend/Plot is to install the PC-DOS operating system on the first of two program disks that VisiCorp supplias.

(Note: Becausa tha software is copy-protected, you cannot make backups. You can only run the disks that you buy. If you inadvertently erase part of the program or damage the supplied disks, you can buy one set of replacements from VisiCorp for $20. If you need another backup, you must start over and buy another copy of tha program.)

After the DOS is installed, insert disk

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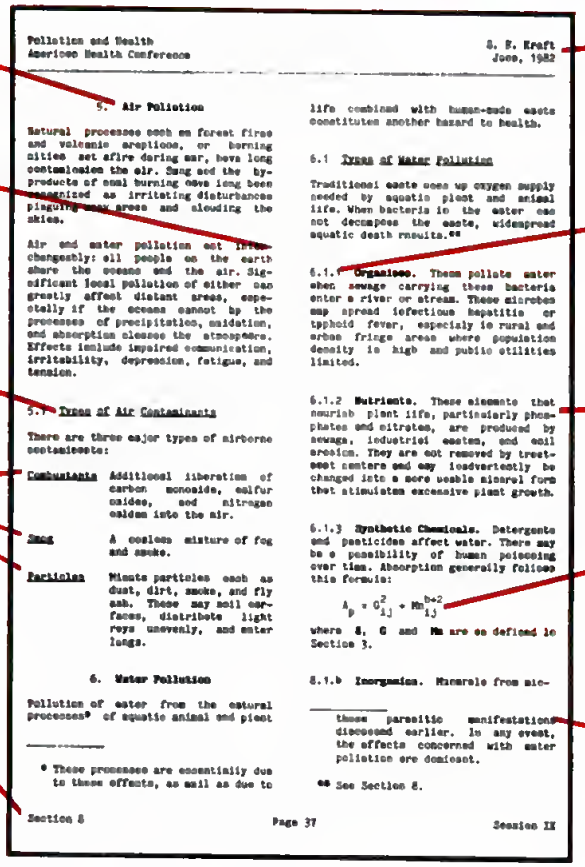

Pollution and Health
American Health Conference

S. P. Kraft
June, 1982

5. Air Pollution

Natural processes such as forest fires and volcanic eruptions, or burning cities set afire during war, have long contaminated the air. Smog and the by-products of coal burning have long been recognized as irritating disturbances plaguing many areas and clouding the skies.

Air and water pollution act interchangeably: all people on the earth share the oceans and the air. Significant local pollution of either can greatly affect distant areas, especially if the oceans cannot be the processes of precipitation, oxidation, and absorption cleanse the atmosphere. Effects include impaired communication, irritability, depression, fatigue, and tension.

5.1 Types of Air Contaminants

There are three major types of airborne contaminants:

Combustants — Additional liberation of carbon monoxide, sulfur oxides, and nitrogen oxides into the air.

Smog — A noxious mixture of fog and smoke.

Particles — Minute particles such as dust, dirt, smoke, and fly ash. These may soil surfaces, distribute light rays unevenly, and enter lungs.

6. Water Pollution

Pollution of water from the natural processes* of aquatic animal and plant life combined with human-made waste constitutes another hazard to health.

6.1 Types of Water Pollution

Traditional waste uses up oxygen supply needed by aquatic plant and animal life. When bacteria in the water can not decompose the waste, widespread aquatic death results.**

6.1.1 Organisms. These pollute water when sewage carrying these bacteria enter a river or stream. These microbes may spread infectious hepatitis or typhoid fever, especially in rural and urban fringe areas where population density is high and public utilities limited.

6.1.2 Nutrients. These elements that nourish plant life, particularly phosphates and nitrates, are produced by sewage, industrial wastes, and soil erosion. They are not removed by treatment centers and may inadvertently be changed into a more usable mineral form that stimulates excessive plant growth.

6.1.3 Synthetic Chemicals. Detergents and pesticides affect water. There may be a possibility of human poisoning over time. Absorption generally follows this formula:

$$A_p = Q_{ij}^{2} + Mn_{ij}^{b+2}$$

where A, Q and Mn are as defined in Section 3.

6.1.b Inorganics. Minerals from mic-

* These processes are essentially due to these effects, as well as due to these parasitic manifestations discussed earlier. In any event, the effects concerned with water pollution are dominant.

** See Section 8.

Section 8 — Page 37 — Session IX

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one in slot A, boot up, and you're on your way. Once your PC digests the first disk, it asks for the second to be inserted in Driva A. In two-drive systems, no more disk shuffling will be necessary as long as you do not axit from VisiTrend/Plot into the PC-DOS operating system.

VISITREND/PLOT is entirely menu-driven.

VisiTrend/Plot is antiraly manu-driven. You implement your menu selection by positioning the cursor over what you want to do and pressing the Enter key.

This technique is probably the simplest and easiest way to operate a program, particularly for the computer illiterate. However, it can ba frustrating for those accustomed to the "enter the number/letter on the menu" style of program, especially impatient users who try to think faster than the cursor moves.

Nota that the VisiTrend/Plot selection process can take six keystrokes (or more, if you have a tendency toward clumsiness) to start one function.

The program displays manus as a pair of horizontal bars with the various available selections listed between tham. Superimposed in inverse video on the menu bars is explanatory information about the choice you've selected or operational information about the program, such as the name of the file you're working from. The main menu directs you into various subprograms, the most important of which includas tha Trend and Plot features.

Steer the cursor onto the function you want and press tha Enter kay. Voila! Another menu. Move the cursor and press Enter again. You could spend all day chasing through menus; you also might get lost if you're not familiar with what you're doing. For instance, If you want to get back to the operating system and you're several menus down, you can have a mazelika chase to get out. It can feel like opening a box only to find another box insida.

LEARNING VisiTrend/Plot's data entry techniques will add a new term to your computer vocabulary: "series."

However, the manual does provide a menu flowchart to help you find your way.

Entering Data

After you've selected a function, you choose one of two methods to get your data into VisiTrend/Plot: You can enter numbers directly after tha propar manu choice, or you can read figures from files, aven files generated by another program, such as *VisiCalc*.

Learning VisiTrend/Plot's data antry techniques will add a new term to your computer vocabulary: "serias."

A series equals approximately one row or column of spreadsheet data. Each graph that the program displays and any data that the program analyzas must consist of one or more series.

You can pull out a series from nearly

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anywhere in any format-compatible file. The manual includes a lengthy explanation of what meteriel is format-compatible—in short, any VisiTrend/Plot files and Data Interchange Format (DIF) files thet cen be shared with other Visi-programs.

If either your date or series is not complete, VisiTrend/Plot's "fill in" feature plugs the holes with interpolated values or extends the data with either arithmetic or geometric extrepolations. Multiple series can be compared to one enother end analyzed end plotted on the same or separate graphs.

Because every series menipulation results in the creation of another series, you cen soon be swimming in them and run out of working memory. Adding more than the required 128K RAM to your system won't help because the program can't use it.

MORE THAN the required 128K RAM won't help because the program can't use it.

You quickly learn how to deploy your series. In my first efforts, I got carried away end had the same series appearing in six places. With experience, you also learn to use the "Clear" function frequently to delete unnecessary informetion from the working memory.

Although it may sound unnecesserily complex, once you work for a while with the series concept, it begins to make sense.

After your computations ere finished, you have several options for displaying them. You can examine the new series you've created (a list of the percentege of sales growth for each month, for instance); you can get e statistical analysis of the dete if you wish to ponder the standard deviation, or you can display the results graphicelly.

Graphics

The no-nonsense, businesslike Visi- approach translates into graphics that are best described as "functional" (see Figure 1). They look austere when compared to the multi-colored works of art that can be genereted with other graphics programs.

MULTIPLE lines can be plotted on a single chart.

There are some compensations thet may warm up your feelings toward this program. No matter what sort of plot you choose, it's traced out quickly with the scele end range eutomatically determined. You're also given full control if you went to change the time base and scale.

Should you err in your choice and try to plot something that shoots off-scele, the program will wern you end refuse to display possibly-erroneous information.

The horizontel end vertical axes are automatically lebeled with information derived from the file containing the series you chose to graph.

Multiple lines can be plotted on a single chert simply by selecting several series

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with a like time bese from the seme file. Multiple plots on the seme chert cen be distinguished beceuse eech is displeyed with different point markers—boxes, triangles, pound signs, end so on.

Should you wish, you can choose e beckground shading to suit your aesthetic sensibilities. Remember, it's monochrome; you get to choose your favorite color, as long es it's bleck, white, or one of two kinds of grey (fine and coarse). On my medium-resolution color monitor, the two greys eppeered much the same. In print, however, there is e definite difference. The same shadings can be selected to turn a line greph into en "eree" graph.

Another beckground choice is e grid, which can heve horizontal or vertical lines or both. This option is availeble for all graphs except pie charts.

Bar grephs are "two dimensional": no ettempt wes mede to use extra perspective lines to meke the bars seem to jump off of the pege. Bers may be either horizontal or vertical. In horizontel mode a full-width/helf-width option ellows two series to be displeyed with corresponding periods edjoining; the elternetive is using stecked bars to show a totel quentity end its constituents. After they are drawn, bars or background can be sbeded es you wish to suit your ertistic temperement.

The roughly circuler pie charts have stricter data requirements and are initielly drawn only in outline. Afterwerd, you ere ellowed only tbe same four sheding choices to dress it up.

THIS SOFTWARE supports a scant number of printers.

An edditionel chert—the high-low-close style of line graph—is eimed particularly et stock market gemblers.

Once your data is charted, you heve the option of edding a single title ebove the greph, one to the side, up to three below, or any number of others thet can be positioned by the keyped control, enywhere on the graph.

If you need more verbiege then the ebove options permit (these are provided within the confines of the plotting subprogrem), edditionel text generated with another subprogram can be overlaid upon your grephics creetions.

In the plot subprogrem, only three typefeces ere provided—normel, bold, end inverse video. On screen it is difficult to tell bold from normel. The text subprogrem elso ellows for double-height cherecters.

Printers

Another example of the no-frills Visiepproech is thet this software supports a scant number of printers: the Epson MX-80FT/IBM-stenderd-issue printer or the MX-100. All require the Graftrax option. By changing the program's printer driver, NEC models 5530 end 7730 end Okideta Microline 83A can also be used. (The printer driver is e softwere function hendled in the "Plot" subprogram, whicb you only need to perform et installation or when changing printers.)

This printer-interfecing scheme meens that you can start producing grephs end charts with little or no extre expense by using the seme printer you use for everything else. Unfortunetely, this also meens thet you cennot use plotters or—as is true throughout VisiTrend/Plot—colors. */PC*

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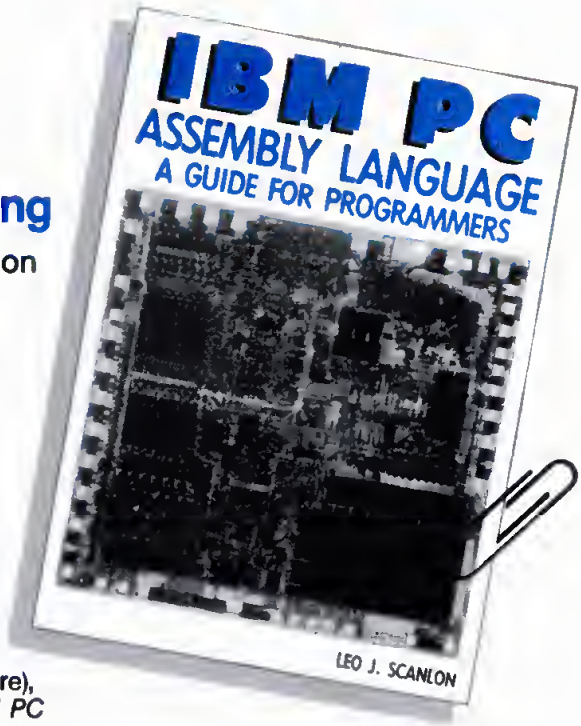

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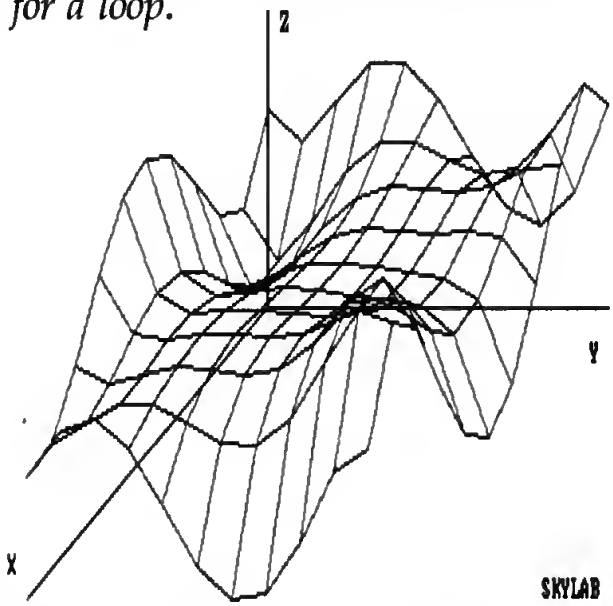
CIRCLE 352 ON READER SERVICE CARD

SOFTWARE/WINN L. ROSCH

This program employs sophisticated math for producing graphs, but its idiosyncracies could throw you for a loop.



The Slightly Twisted Plot of Curvfit-3D

Curvfit-3D
Mark A. Herkommer
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(214) 494-3364
List Price: $90
Requires: 64K, one disk drive (graphics monitor recommended).

CIRCLE 591 ON READER SERVICE CARD

Curvfit is a powerful data analysis tool that enables the IBM PC to make complex calculations formerly reserved for mainframe computers.

More concretely, this means that Curvfit takes raw numbers and plots them on a graph, drawing the simplest curve or 3-dimensional surface that connects them.

This amounts to more than merely connecting the dots. Curvfit analyzes data by finding a mathematical equation, the polynomial expression of a given order, that best describes the data. Then it lets you see the results in graph form.

It can illustrate important trends for business people or show scientists how to best interpret their experiments or measurements.

Indeed, whenever it lives up to its potential, Curvfit is a useful, powerful software tool.

CURVFIT IS a powerful IBM PC to make complex calculations formerly reserved for mainframe computers.

Its hardware requirements are relatively modest: 64K, a disk drive, and obviously, if you want to see graphics, a graphics monitor.

Encountering Curvfit

After playing with Curvfit for a while, I feel that it is the software equivalent of a funky little tome scribbled on coffee-stained notebooks by a Greenwich Village poet. The times appended to the file display—in the vicinity of 1 a.m.—bear out my mental image of a software scrivener copying disks by candlelight.

Curvfit's packaging is inauspicious—a thin plastic bag filled with a few loose sheets of paper and one floppy disk. Its documentation is forbidding, at least to the technically uninitiated. The pages are filled with notations that only an engineer can appreciate.

Deeper down, too, once the program lodges itself in drive A: you can see Curv-

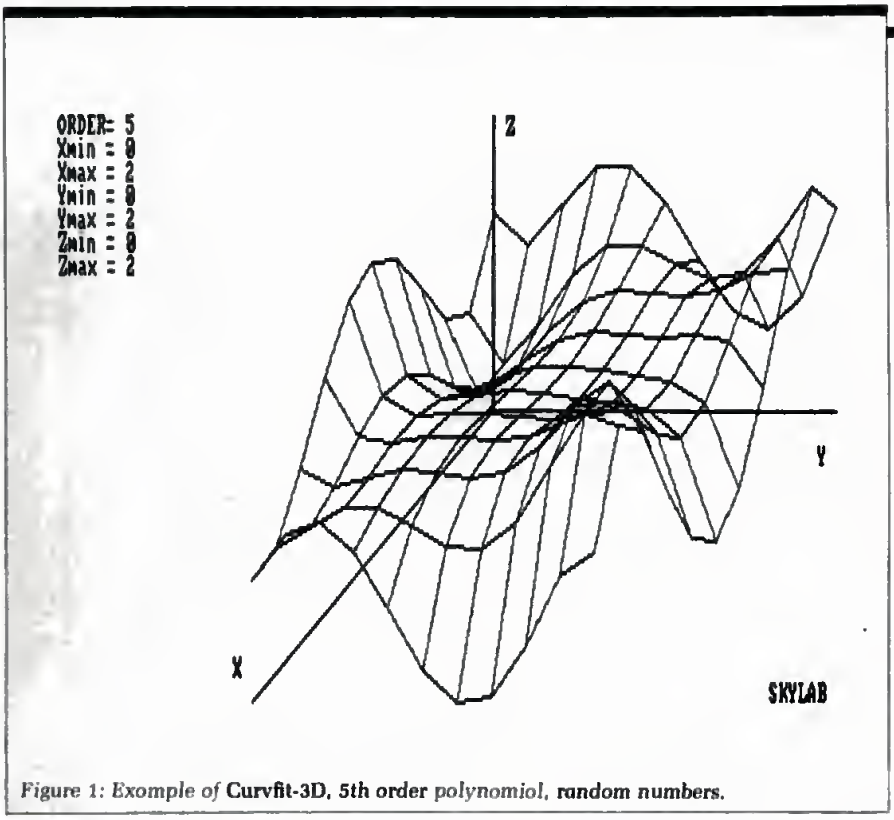

Figure 1: Exomple of **Curvfit-3D, 5th order** *polynomiol,* **random numbers.**

fit's flaws. Curvfit 3-D could best be described as neat, useful (but could be better), easy to use (but could be much better), reasonably priced in relation to its value, and idiosyncratic.

The biggest hurdle you'll have to clear with Curvfit is the documentation, which is scanty and more academic than the average PC enthusiast will want to deal with.

"Scanty" means that the instructions for backing-up, loading, and running the

THE BIGGEST hurdle you'll have to clear with Curvfit is the documentation.

program, for instance, take only 2 inches of a 4-inch-wide column. Read "Step six," and you'll understand the philosophy of the documentation: "Follow screen

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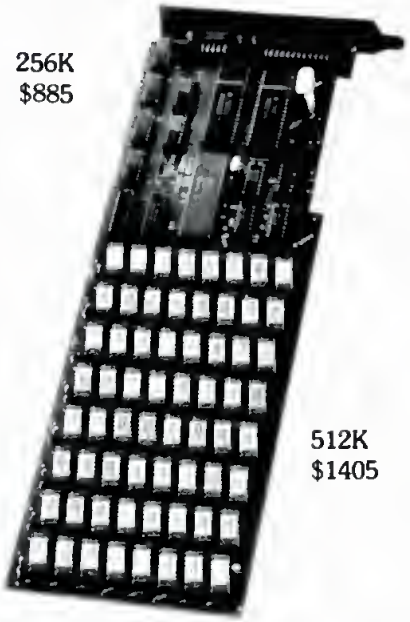

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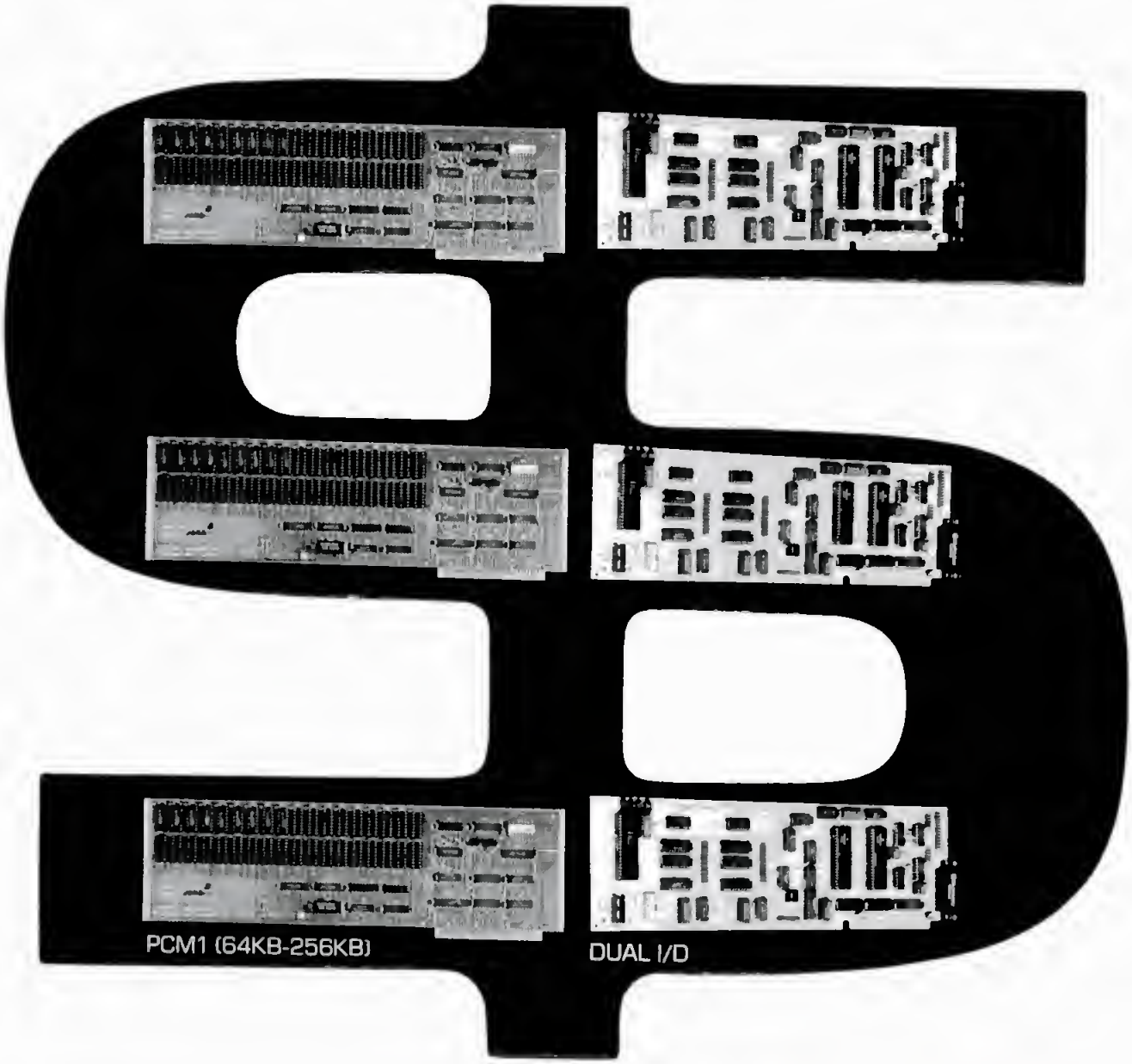

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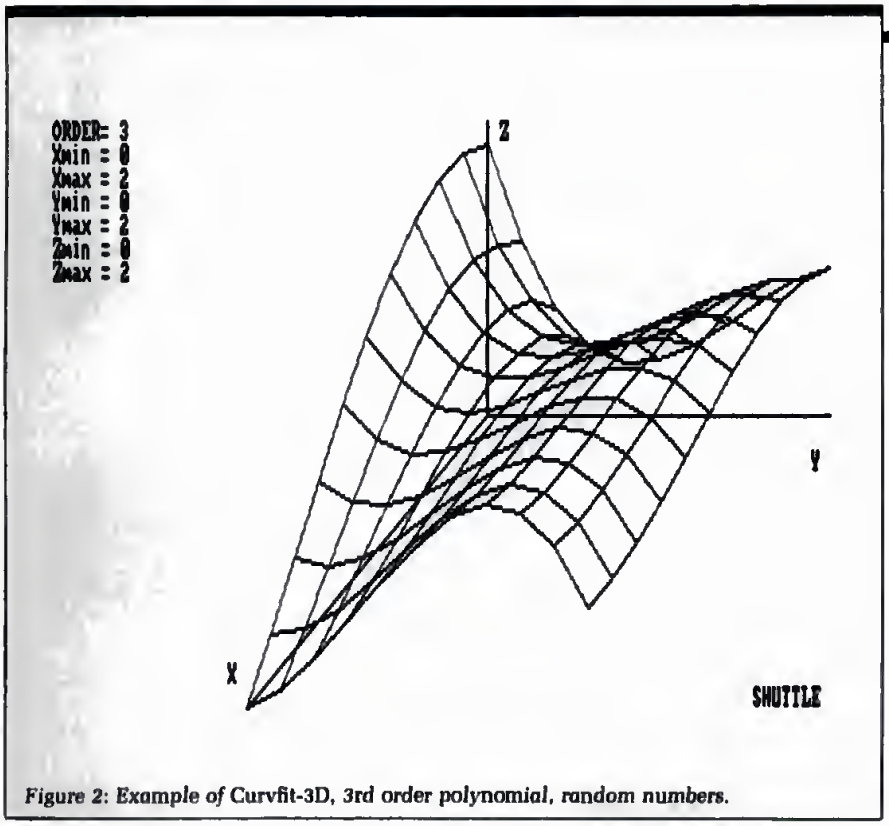

Figure 2: Example of Curvfit-3D, *3rd order polynomial, random numbers.*

instructions until copy is complete."

Curvfit assumes a rudimentary knowledge of the workings of programs written in BASIC, so users must fumble their way through without guidance.

Once I toyed a while with the program, the documentation did make sense. Somehow, though, I thought it was supposed to work the other way around, with the documentation making sense of the program first.

Running Curvfit

If you've had any experience operating your PC, however, you'll have little problem running *Curvfit* the first time. The on-screen prompts explain themselves. Initial choices include a title for the data, destination (screen, printer, or file), the number of dimensions for plotting (two or three), the order of the polynomial to be derived (this is approximately equal to how many twists you want in your final curve), and the number of data points that you will supply to *Curvfit* to generate the final curve (see Figures 1 and 2).

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CIRCLE 432 ON READER SERVICE CARD

data will come from an existing file or from the keyboard (manually).

ENTERING data through the keyboard is tricky, because the program is not very forgiving.

Should you choose to download a file, its contents must satisfy *Curvfit*'s strict requirements; your data must be listed as numbers alone without any guidas.

Entering data through the keyboard is tricky, because the program is not very forgiving. If you discover an error in a figure after it has been entered, your only choices are to start all over again or forge somewhat mistakenly ahead; *Curvfit* provides no editing facility at this stage.

Considering that as many as 1,000 coordinates of three dimensions each may be entered, the chance of error looms large.

Displaying Calculations

After your final entry, *Curvfit* automatically calculates everything. If you've got a lot of data and you're looking for high order results, take a coffee break. Computations can take quite a while, 15 minutes or more for really heady stuff.

If you're reasonable in your demands, however, there's nothing to fear. My 20-point arrays took less than a minute, even up to eighth-order polynomials in 3 dimensions.

Next, the results—derived coefficients, maximum values, deviations, and the "fit" of the curve—are displayed.

At this point you are finally allowed to go to a menu from which you can display a graph of the results, edit your errors (at last!), change variables, or dump everything and retreat to PC-DOS.

Enhanced Mistakes

The menu's default, selection 0, will execute if you happen to press the Enter key and nothing more. Unfortunately, this option returns you to the operating system, and everything you've done goes to the great data bank in the sky.

I found *Curvfit* tended to give up and dump back to the operating system all by itself. More than once the screen went from a graph straight to oblivion without passing the menu, possibly because an inadvertant Enter command was floating somewhere around inside the computer, left over from the last command.

CURVFIT tended to give up and dump back to the operating system all by itself.

"Be careful," would be good advice to

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CIRCLE 104 ON READER SERVICE CARD

users. "Change it," would be better advice to the author.

Note thet elthough you cen route your results to your printer when you pass the turnstile to get into Curvfit, the progrem has no screen dump. If you make a wrong choice when you start out, there's no going back; you'll have to recalculate everything, end maybe even reload.

Error messages don't abound, the advice is not particularly informative. For instance, when I tried to plot points I knew were on e sphere, Curvfit told me the solution was impossible but kept plotting in en effort to find it anywey. in my mathematical naiveté, I might have thrown Curvfit e reel curve accidentally, but I would have preferred to be told exactly what my transgression was end be warned thet the resulting plot would be ineccurete.

THE PROGRAM'S flaws make for unexpected glitches.

Nevertheless, the plotted results help you visualize your data, whenever the progrem runs correctly. In 2-dimensional mode, Curvfit plots the data points and drews a smooth curve or e straight lIne, depending on the order of the polynomial. The greph is captioned with your previously chosen title, end the exes are lebeled in exponential numbers corresponding to your data.

Three-dimensional dete is plotted es a "fish-net" surface without lebeled axes.

Without trying, I got Curvfit to crash at this point, with e continuous scroll of "Memory Overflow. Value is larger than can be stored in memory. Try again."

A ROUGH tool sometimes is worse than no tool at all, especially to a novice.

The only recourse I found was booting up again; after that, every last keystroke of the 40 points I had entered was, of course, gone. It would be nice to be told what to do—and even better if crashes like this did not happen.

In summation, then, Curvfit isn't terribly hard to learn or use, but the program's flews meke for unexpected glitches.

The program does follow through on promises of its capabilities. If your work requires e substentiel amount of analysis, Curvfit may prove useful.

It's elso nice to be able to call the author on the phone to try to work out problems, rather than dialing up some reluctent corporate software supplier. "Telk to your dealer," is never e setisfying answer, particularly when your dealer in turn recommends calling the softwere compeny directly.

Curvfit 3-D is the first of e series of programs, promises Herkommer. However, if they're as rough as Curvfit when they're releesed, his promise mey be a threet. A rough tool sometimes is worse then no tool et all, especielly to e novice.

Polishing up the present product should be e better priority. A little work could meke Curvfit 3-D much more useful, or et least less forbidding. /PC

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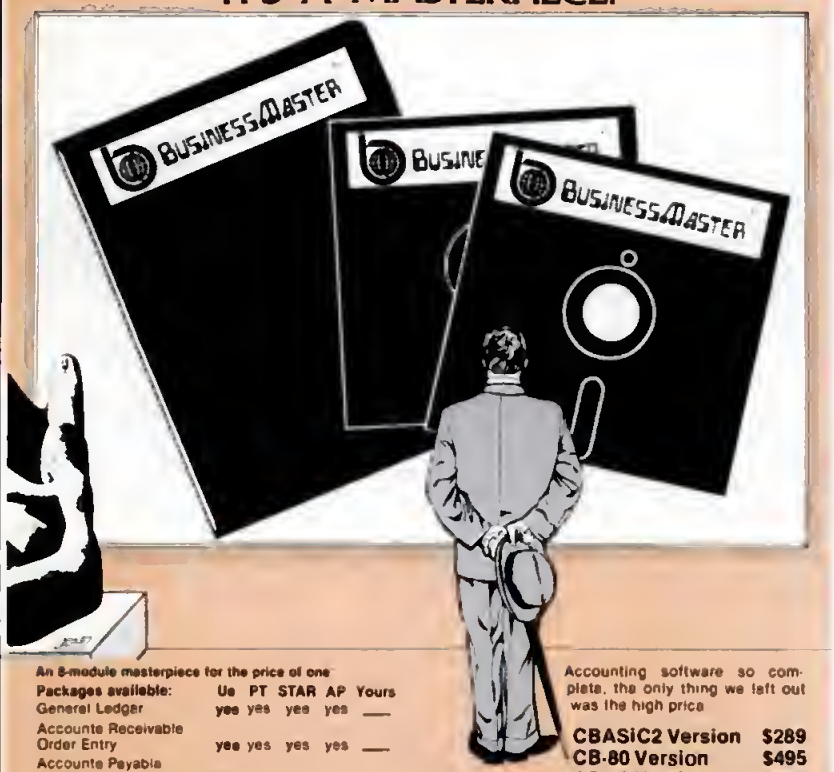

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You have to buy both.

Buy the software first.

Since the reason you're buying a computer is to get the capability the software gives you (remember, it's the software that knows how to get things done), it makes good sense to pick the software first.

Start by making a list of the things you want to use the computer for. It can include almost anything—any kind of inventory, filing, accounting, graphics, reporting, record-keeping, analysis—you name it and there's probably a software program that does it.

Next, take the list into a computer store and ask the salesperson to give you a demonstration of the program, or programs, that will do the things you want.

Even though you'll need a computer for the software demonstration, keep in mind the computer is just a vehicle. The software is the driver. And once you've decided on the software, picking out the rest of the computer system will be much easier.

The simpler the better.

Look for software that's easy to learn, easy to use, and that does the job in the simplest way possible.

Good personal software should be, as the computer people say, "friendly." Meaning that it helps you do what you have to do without getting in the way.

Meaning there are no complicated routines to follow to perform a simple task. And no programming language to learn.

Some people, however, will tell you that software has to be complicated to be powerful.

Nothing could be farther from the truth.

Because in order for a program to appear simple to you on the outside, it has to be extremely complex on the inside.

ABOUT BUYING A HERE'S SOME HELP.

Good software keeps the complications in the computer, where they belong. And keeps the capability at your fingertips. It's that simple.

You simply have to see for yourself.

You can read any number of interesting books and magazines about personal computers. You can ask friends who have them. You can look at all the sales literature you can get your hands on. And you should do all those things before you decide to buy.

But as helpful as all that can be, there really is no substitute for a real, live demonstration.

When you do go out shopping, we recommend you take a look at the PFS® Family of Software.

The PFS family is designed the way we think all software should be: simple, straightforward and powerful.

Currently, three products make up the family. PFS:FILE, PFS:REPORT and PFS:GRAPH, with more programs on the way. Here's a little more about each of them.

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Basically, FILE works like a paper filing system, without the paper. So you can record, file, retrieve and review information in a fraction of the time it takes with a conventional filing system.

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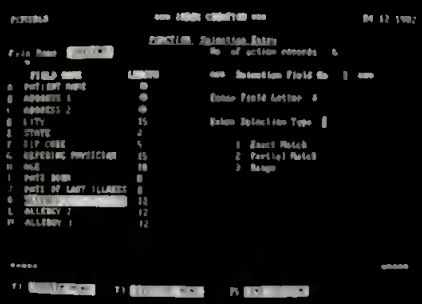

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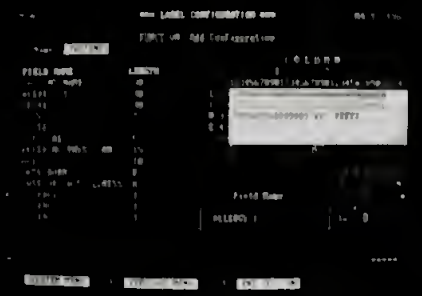

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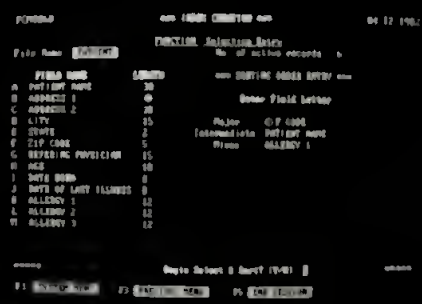

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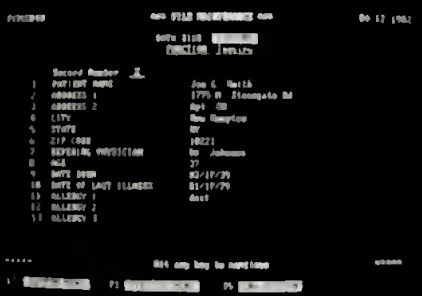

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CIRCLE 599 ON READER SERVICE CARD

Timas are changing. It usad to be that the introduction of a new word processor was big naws. Now, word processors are a dime a dozen. It's practically the sama story with spreadshaets, databases, mailing lists, graphic plotters, and other software packagas. With tha axponantial explosion in tha number of small computer owners in the country, more inexperienced computer users are facing the task of salacting programs among the many diffarent varietias of softwara and than trying to use them. Experienced users are tired of switching disks and oftan reentering information whan changing from one vendor's database to another vendor's word procassor. Tha cry baing haard now is, "Giva us a package that will do it all in ona program!"

Owl Software is one of the few companias that has taken a atap toward giving the consumer an easy-to-use integrated software package. TextPlus combines a word processor with a database to produce a package capable of handling many different applications. Also, the program includes other options, like bar plots, print spooling, and calculator features. And unlike many "combo" packages that cost close to half the price of most microcomputars, TextPlus gives you all of its taxt/data power for only $240. TextPlus does not includa communications, spreadsheets, or graphics faatures lika soma of tha othars, but if a word processor and a database are all you nead, it will be hard to find another package that beats its performance for tha prica.

TEXTPLUS combines a word processor with a database.

Requirements

Tha minimum system required to run the 128K version of TextPlus includes a PC, ona disk drive, an 80-column monitor, and PC-DOS. If you hava only one 160K driva, you will hava to switch disks whan going from a text fila to a data file. Tha TextPlus systam is mada up of three major programs, and quita a few small data files are used for Help prompts and other system functions. To use a 160K disk driva, the data program and the text program have to be split on separate disks, since thay are too big to reside on the same 160K disk. If you have ona 320K drive, you could store all the programs on ona disk, but thare would be littla room for taxt and data filas. The bast solution is to hava two disk drivas, ona for the programs and the other for fila storaga.

One last requirement is 84K or 128K RAM; varsions of TextPlus are available for both capacities.

The 128K TextPlus is a compiled version offering fastar rasponsa time, larger file capabilities, and some additional features not found in tha 64K varsion. I used the 128K version for this review. If you have more than 128K of RAM, you can use it with tha program's print spooler, which allows you to set up any amount of RAM to be used as a print buffer. I set up about 32K of my systam's 256K as a print buffar. I found that I only had to wait about 3 seconds after issuing the print command before TextPlus was free to do something

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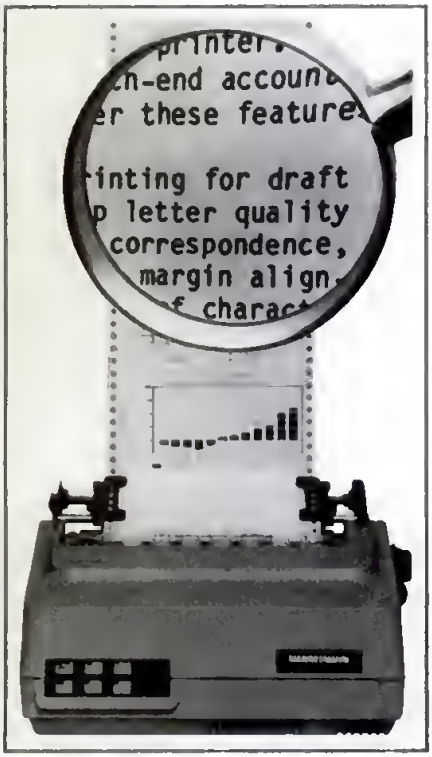

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else while my report was being printed.

Owl Software's package will support a hard disk if you heve one. The system is initially set up to handle either an Epson, an IBM, or a C.Itoh correspondence-quality printer, but its "printer typestyles" file ellows it to be configured to just ebout any printer. I configured my C.Itoh dot metrix printer with TextPlus and could produce 10, 12, or 17 character-per-inch (cpi) text or proportionel print in eny combinetion of normal, expended, and bold typestyles. The IBM monochrome display is the defeult terminal, but two- or multicolor terminals can also be selected. The system will support a two-bin sheet feeder.

Applications

The combination of a word processor and a database provides so many epplication options thet I could not possibly list them ell. However, the options displayed (see Figure 1) when the Create option is chosen from the TextPlus main menu will give you some Idea of possible epplications. As you can see, meny options are alreedy set up for you. If your appllcation does not correspond to any of the first 11 options, then you can set up your own specified file with option 12. Option 11 is for editing and creating program files in BASIC, Pascal, or assembly language. (I tried using it to edit e FORTRAN file that was created with the PC-DOS EDLIN, but I could not get my changes to work.) Text File and Data File, options 1 end 4 respectively, are streightforward applications of word processing end database management functions. The other options are varietions of each or combinations of both.

Figure 1: Menu of Create options.

```
1  - TEXT FILE
2  - BUSINESS LETTER
3  - MERGED TEXT AND DATA LET-
       TER
4  - DATA FILE
5  - TELEPHONE LIST
6  - MAILING LABELS (3 LINES
       MAX.)
7  - MAILING LABELS (4 LINES
       MAX.)
8  - MAILING LABELS (5 LINES
       MAX.)
9  - TABULAR FILE
10 - PLOT FILE
11 - PROGRAM
12 - USER SPECIFIED
```

MORE THAN 128K of RAM allows you to set up a print buffer.

Overview of Options

The main menu, displayed when you first enter the program, is shown in Figure 2. Most of your time will be spent in option 4, Change/View File, which edits both text and data files. To start, create a new file (option 3) or read an existing file from disk for editing (option 1). Option 9 from the main menu lists a directory of what is on any drive. The Help option displays several screens of useful information on any aspect of TextPlus. There are other Help screens evallable when you are editing files. (I will cover options 5 through 8 and 11 through 13 later in more deteil.)

The last cholce is Program Selection, which loads one of the three major pro-

Figure 2: Main menu for TextPlus

```
1 - READ FROM DISK
2 - SAVE ON DISK
3 - CREATE A NEW FILE
4 - CHANGE/VIEW FILE
5 - DISPLAY
6 - PRINT
7 - PRINT MAILING LABELS
8 - PRINT PLOT
9 - DISK DIRECTORY
10 - HELP
11 - MERGE/SPLIT DATA FILE(S)
12 - SELECT PARTS OF FILE(S) FROM
       DISK
13 - SORT
14 - PROGRAM SELECTION
```

"No, we're all okay, but our computer's gone."

It could have been a lot worse.

Luckily, all that was missing was the computer and some spreadsheet software. And that should be covered by insurance.

But it isn't. Ed didn't realize that once he started using his home computer on business projects, his homeowners insurance no longer would cover it.

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grams into memory or lets you exit TextPlus. To accommodate single-density disk drives, Owl Software divides its system into three parts: the Taxt program, tha Data program, end the Select program. Depending on what kiud of fila you want to work on or what you intend to do with it, you have to select ona of thasa three programs. If you want to work on a business letter, loed the Text program. If you want to work on e teiephone list, load Data. The Salect program is usad whan you want to sort data files or salect specific records or fialds from en axisting detabase. Be sure to load the correct program first before reeding the file from the disk for editing. For example, I was in the Text program when I read e data fila from disk. When I tried to update the dete file using option 4, the Data program loaded automatically, but tha data fila that I had praviously read was eresed from RAM; I hed to reed the deta into memory again. The correct procedure is to select the program first, then read the file to be changed.

IF YOU WANT to work on a business letter, load the Text program.

Text File Capabilities

TextPlus provides most of the features included in popular word processors eveileble today. The meximum text record length is 79 characters. The maximum text file is 33,000 bytes on a system with 128K RAM, and 46,000 bytes with 192K RAM. All the stenderd commands are included: word wrap, heeders end footers, right mergin justificetion, centering, underlining, moving, copying, seerching, automatic replecing, merging, laft/right pega numbering, and splitting tha current fila into two files. Despite the number of commands, deficiancies in the wey TextPlus displays tha taxt being adited and the awkwerdness of some commands keep the peckage from being compatitive with stand-elone word processors.

Thare ara two basic ways to edit and format taxt filas: either through commands using the PC function keys or with what Owl Software calls "imbedded commands." Most of the ectual editing is done with the function keys. I consider this e definite advantaga. Word processors should limit es meny commands as possible to a single keystroke. The possible commands ara displayed on line 25 of the scraen. Since there are more than ten editing commands, pressing F2 selects and

MOST EDITING is done with the function keys.

Co-owner Jack Abbott says, "*I hope you've been reading my review series in Byte magazine on Database Management Systems. Please call me at (602) 842-1133 if I can be of help in solving your software requirements.*"

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displays e different set of edit commands with changes in the meaning of five function keys (see Figure 3). Also, when you wish to enter or exit the block insert mode, the BLKINS commend (F1) changes to ENDINS.

Most of the commands work similarly to commands in other word processors. A couple of them need some explaining. SETL allows you to go to any line in the document. Unfortunetely. you cannot jump to eny particular pege number, only line numbers. This means you have to keep track of which lines ere on which page. Most word processors continuelly displey the current character position, line number, end pege number; *TextPlus* does not. ADD ellows you to enter lines of text et the end of the file. You can split the file being edited into two files using the SPL commend. SKIPW moves the cursor from the beginning of one word to the

Figure 3: Function key commands. The olternote set is selected by pressing F2.

```
                Initial Function Key Commands
F1=BLKINS (Block Insert)              F6=SETL (Set Line)
F2=FKEY (Change Function Keys)        F7=SRCH (Search)
F3=MOVE (Move Text)                   F8=HELP (Help)
F4=DEL (Delete)                       F9=SKIPW (Skip Word)
F5=ADD (Add Lines to End)             F10=DW (Delete Word)

                Alternate Function Key Commands
F1=BLKINS                             F6=MERG (Merge File)
F2=FKEY                               F7=REPL(ReplaceString)
F3=SPL (Split file)                   F8=FRMT (Format)
F4=DEL                                F9=SKIPW
F5=COPY (Copy Text)                   F10=DW (Delete Word)
```

WORD processors should limit as many commands as possible to a single keystroke.

next. However, one disadvantege is that TextPlus does not continuelly reformet the display after deletions and insertions. If you went to reformat the screen after some changes, you heve to enter the FRMT command. This executes in about 3 to 4 seconds for e short file end can run es long es 20 seconds for e large file—very annoying to enyone who hates weiting.

Imbedded commends are used for text formetting. Some of these are placed et the beginning of the text while others are pleced throughout the text where needed. These commands set up the margins, word wrap, cherecter print styles, justification, heeders and footers, centering, line spacing (1, 2, or 3 lines), page breaks, tabs, and underlining. The underlining procedure is very cumbersome. If you wanted to produce e sentence with e word underlined in the middle, you would heve to enter three lines in this fashion:

```
This is a line with a
ul=word
underlined.
```

At print time, these three lines will eppear this way:

This is a line with a word underlined.

The wey the underline command appears on the screen does not represent the text es it will be printed. This applies to the other imbedded commends as well. I look forward to the dey that e microcomputer word processor will displey the text on the screen exactly as it will be printed, complete with underlining, boldfece, end so forth.

One of the nice features of *TextPlus* is its ebility to easily merge database information (like names and addresses) into a text file for generating a mass mailing. Another asset is the ability to create card

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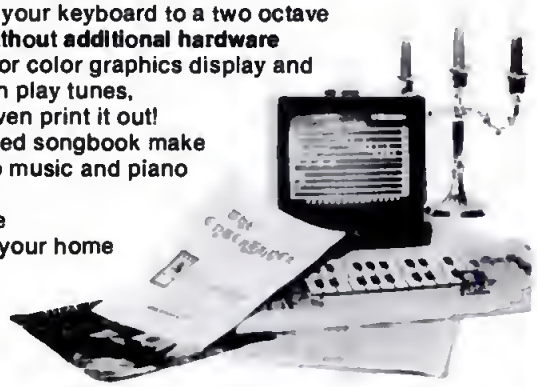

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Figure 4: Menu of function keys in Change/View File mode.

```
F1 - ADD NEW RECORDS
F2 - CHANGE/VIEW RECORDS

F3 - DEFINE A NEW FIELD
F4 - ADD NEW FILE COMMANDS
F5 - CHANGE/VIEW FILE COMMANDS

ESC- RETURN TO MAIN MENU

PRESS FUNCTION KEY OF YOUR CHOICE
```

files of miscellaneous information. By using option 12, Select Parts Of File(s) From Disk, you can get a new file that contains all occurrences of certain strings or groups of strings found in the mein file. For example, you could extract all the paragraphs from your "card file" in which the phrase "word processor" appeared. Then all paragraphs containing this phrase would be grouped in a new file of information about word processors.

Data File Capabilities

The maximum data record length is 253 bytes, with a maximum field size of 72 bytes (21 fields per record is the maximum). The maximum data file size is 37,000 bytes with 128K RAM, and 41,000 bytes for 192K RAM. You can have only up to 1,000 records per deta file no matter how much RAM is in the PC. This can be a problem for anyone who wants to create large databases, but for most people the 1,000-record limit should be adequate.

TextPlus has all the usual datebase commands that allow you to work with data files. When creating a database, you are asked to select the title for eech new field, as well as how many characters will be allowed in the field (the length can also be variable). The program will ask you if the record informetion is numeric or alphanumeric. Then you can define more fields or start entering records. When you change the database, the menu shown in Figure 4 is displeyed. The functions of all of these commands are obvious, except for the last two. These allow you to add or change data file commands similar to the imbedded commands in text files. With the date file commands, you can set the number of spaces between columns, number of sets of records per line, spaces between records, and page titles. The database commands make it very easy to browse through the data records both forward and backward, starting from any selected record.

THE DATABASE commands make it very easy to browse through the data records.

Once you have set up a database, option 13 (Sort) from the main menu makes it easy to sort information by any field(s). Selecting certain fields or certain records from an old file or group of files can be accomplished easily with the same Select option that was used to pick paragraphs from card files of text. Option 11, Merge/Split Data Files(s), takes two data files and merges them or splits one file into two or more.

Report Generation

Options 5 through 8 on the main menu give you four ways to produce a report from your text or database file. Display (option 5) takes your report and displays it in finished form on the screen so that you can see how it will look before printing. The only drawback applies to files containing compressed text (like 17 cpi) that results in more than 80 columns of characters. Each printed line will be shown as two lines since the monitor can display only 80 columns at most. In addition, not

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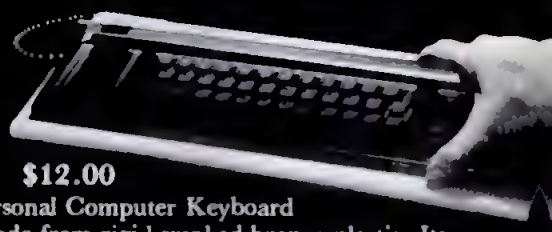

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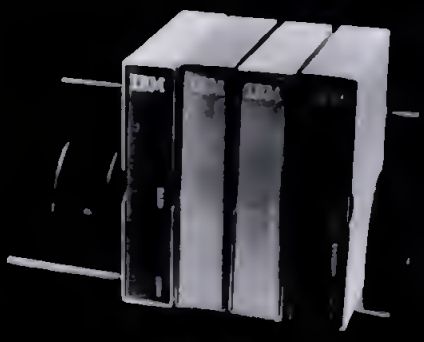

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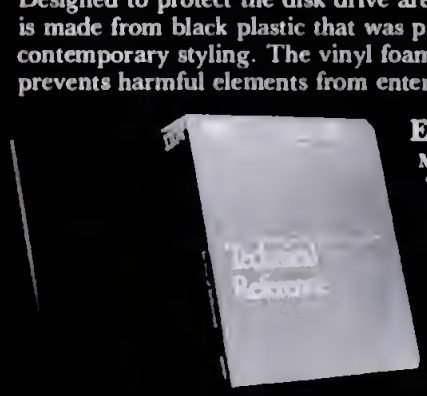

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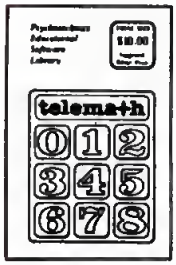

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all of the different typestyles can be displayed correctly, though proper underlining is shown.

The Print option can print your data or text file. With both the Display and Print options, you can choose to output multiple files. From the Change/View mode, an imbedded commend can cause the file to be copied into a disk file instead of through the printer. When you print a data file, you can select to have that dete printed in tabuler form, with optional average and percent columns automatically added. You can also choose to have totals and subtotals for selected columns. At print time, merging data from an existing file or from the keyboard into e text file, such as a business letter, is possible. You have to select this option beforehand by including the appropriate imbedded command in the tabular data file or merged text file.

YOU CAN have data printed in tabular form.

TextPlus provides an easy way to print 3-, 4-, and 5-line labels for mass mailings. The 5-line label will look like this:

```
FIRST NAME(S) LAST NAME
TITLE OR DEPARTMENT
COMPANY
STREET ADDRESS
CITY AND STATE ZIP CODE
```

The label output is restricted to one column per page, which is a limitation I feel Owl Software should remove.

The last print option is Print Plot; this takes the informetion in e detabase file and produces a histogram plot. You are prompted for xmin, xmax, and xstep when you first create e plot file; these variables set up the size and increments of the plot. You also set up the vertical and horizontal titles for the x-axis and y-axis with imbedded commands. The histogram shown in Figure 5 was producing using Print Plot.

Manual and Ease of Use

The manual comes in a nice-looking brown notebook about the size of the IBM manuels. It is divided into six chapters

Figure 5: Histogram for sales of three products over a nine-month period.

```
unit sales quantities (in 1000's)
                I         9
                I         9          8
                I         9         89          8
200             I         9         89         78
                I         9         89        678
                I        89         89       6789
                I        89        789      56789
                I        89        789      56789
150             I        89        789      56789
                I        89       6789      56789
                I        89       6789      56789
                I        89      56789     456789
                I        89      56789     456789
100             I      6789      56789    3456789
                I      6789     456789    3456789
                I      6789     456789   23456789
                I     56789    3456789  123456789
                I    456789  123456789  123456789
 50             I 123456789  123456789  123456789
                I ---------------------------------
                  a          b          c

                                First nine months of 1983
```

and a brief introduction. The first chapter expleins how to get your disks in ordar and configure TextPlus to your monitor and printer. These instructions are clear and conclse. The naxt section is a quick overview of the systam to get you started and orientad with the different commands. The third chapter describes how to usa tha Chenge/View option (onca you start using the program this is where you will spend most of your time), while the fourth dascribes the rest of the commands. I would have liked more examples in these last two chaptars.

Examplas of ebout 15 different epplications are covered in the fifth section. Owl Software even includas saveral example filas on e disk that tekas you through thase examples, along with a start-up file with examples that introduce you to the antire packaga. This start-up file is set up so as not to allow you to make a wrong entry; only correct responses are accapted by the system. I thought this was an excallant training aide for new owners.

Tha last chapter is a complata list of possible error messagas with thair descriptions and what to do when they occur. This is probably the best job I heve seen from e software vendor regarding error explanations. I applaud Owl Software for doing whet all vendors should be doing anywey—aspecially as they sall products to more and more inexperienced computer users.

The system is easy to use. Most commands are antered by pressing e function key. Thare ara e couple instances where you have to wait sevaral seconds while the system is busy doing somathing, lika reformatting tha text files. You also heve to wait ebout 8 seconds while the systam loads one of its three main program blocks. TextPlus does includa a print spoolar option that allows you to set up any amount of RAM for a printar buffer; this saves considarable time. I did not have any system problems in which TextPlus did something it should not have. It appaars that tha program has been wall testad for bugs.

PRINT PLOT takes the information in a database file and produces a histogram plot.

THE PROGRAM has been well tested for bugs.

Pluses and Minuses

The big advantage to TextPlus (end other combination software packages) is its ability to work with both text and data in a single program and avoid switching disks and copy files back and forth to eccomplish tha sama results. Owl Software has designed and markated a systam that does this very wall. The package includes many features that make it attractive: histogram plotting, printar spooling, sorting, easy printar and tarminal configuring, and the data/text Salect capability.

I beliava that incorporating a bettar word processor program, the taxt displays of which look more lika tha printed format, would make TextPlus a better combination packaga. More output format commands for dete filas end a larger number of records allowed per file would improva the package even more; the ability to handle more than 80 columns on tha screen would also be nice.

TextPlus doas not giva you e word processor or databasa that is comparable with the leading specialized programs in thesa fields. It lecks the versatility and "polish" that the leaders hava. However, Owl Software's package does provida a good word processor and a good database that can easily handle most appllcations. Soma of the commands are awkward to use, but this is e limitation you can liva with. Most of the combination packages offered by other vendors suffer from the same problem: jack of ell trades but mastar of nona. Overall, I doubt that any othar availabla peckage that combines the same sat of applications programs could have a bettar price/performance ratio. I would say thet anyona who invasts in Owl Software's TextPlus has mada a wisa decision. /PC

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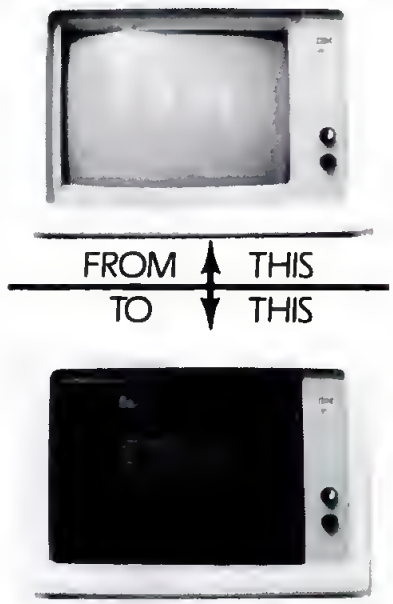

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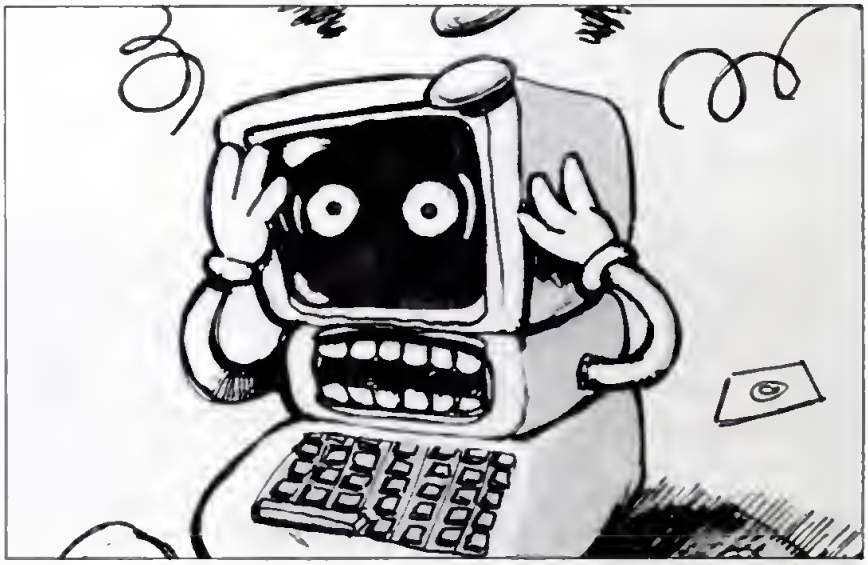


I'm e professional writer who specializes in the computer field. I heve one of the world's most sophistlceted microcomputers in my home and e second machine in my office. Why, then, does my desk look like e stationery store efter a tornado?

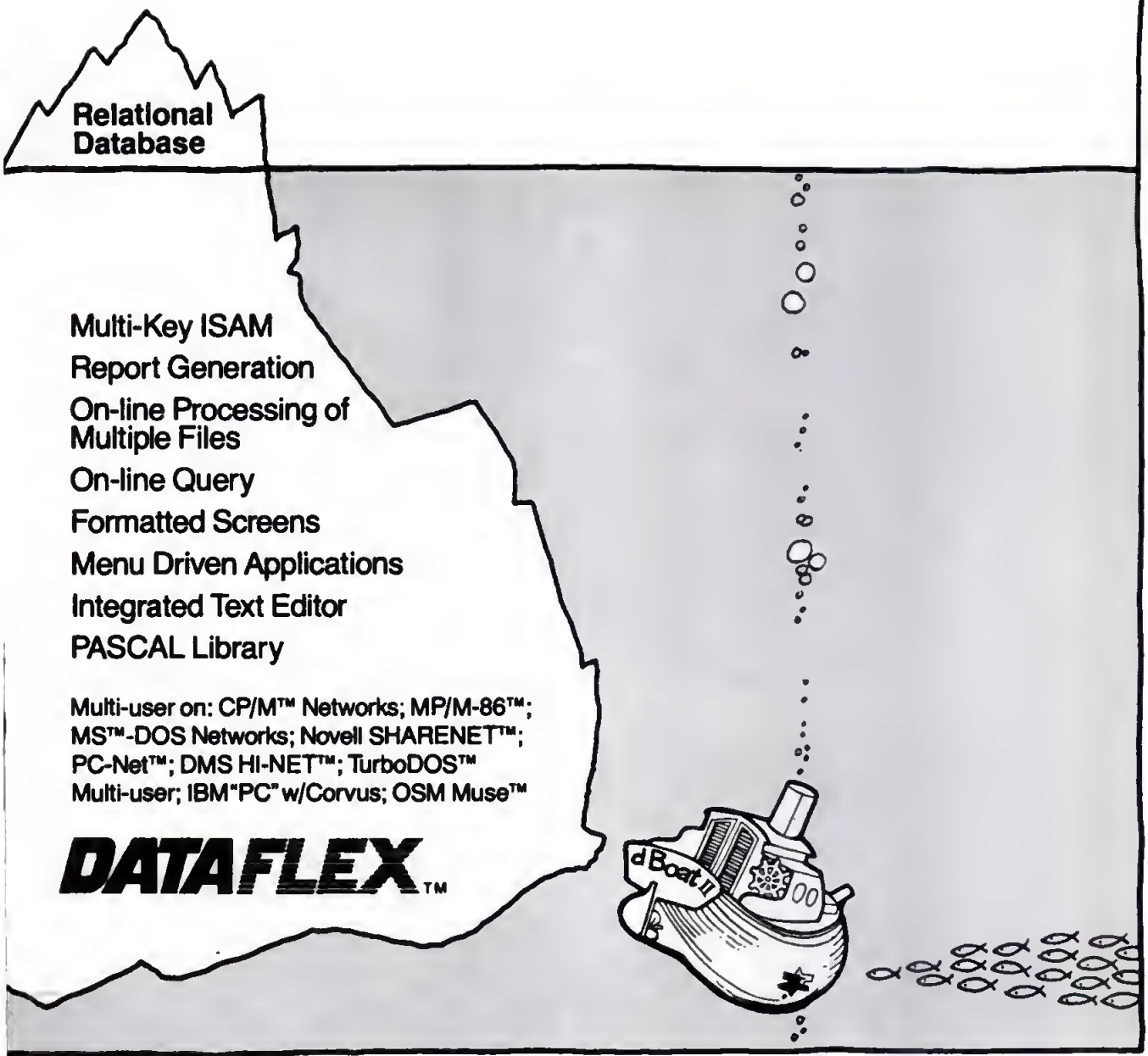
The answer is that I bave not yet found an easy-to-use, quick end logicol personal detebese. Sure, there are the *DBose IIs* end the Condors end other very capeble detabase managers. And there are the *Visi-Dexes*, the *Desktop Orgonizers*, end the *Cordboxes*. But these all require the user to have e strong system of organization already in place. These work fine for those with e netive sense of organization, but like many writers, I require a considerable emount of "creative clutter" and disorgenization to keep the juices flowing.

DATAFAX comes very close to the sort of unstructured tabula rasa database I've been looking for.

Help at Last

Enter *DotoFox*. This keyword data base progrem, though not perfect, comes very close to the sort of unstructured tobulo raso detabase I've been looking for. I just might uncover the top of my desk sometime this year.

With this program, I can maintain records of telepbone calls, letters, appointments, assignments, money owed, money peld—in other words, the sort of information now stored on scraps of paper on my desk. The *DotoFax* is capable of keeping track of more structured information, as well. A printing format control allows you to maintain a mailing list with additional (unprinted) information on accounts. The *DotoFox* sort commands allow informetion to be ordered by alphabet, assigned numerical order, dete of entry, specific subject, or any other scheme you might devise. An obvious use for this free-form program is preparation of catalogs.



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DataFax allows you to create as many as 3000 electronic "folders" of your own design in e particular detabase. The number of folders is limited by the amount of disk spece evelleble end the length of eech entry. Each of the folders may have as many as 255 pages of information, with up to 60 labels or keywords assigned.

Quite simply, *DataFax* presents you with a blank screen on which to type—no forms to fill out, no significant strictures on the sort of information you may place on the screen. You can mark any word or number on the screen for indexing or cross-referencing. You can even add words to the index that do not appear on the file but might otherwise be of assistance to you in a search. There is also an Autokey command thet eutomatically lebels each file folder with e particular set of keywords.

Searching

DataFax allows you to search through files in two weys: Examine end Scan. Scan lists the file folder names of all documents that meet the criteria of the search. Exemine produces the full folder or folders.

Suppose you have a DatoFox database consisting of several hundred folders of information ebout your favorite restaurants. The simplest kind of search involves a single key. Enter "Chinese" end hit Return twice, and the program will either list the names of all folders thet include that keyword (if you are using the Scan command) or displey the full contents of each folder that meets this criterion (in the Examine mode).

DATAFAX allows you to create as many as 3000 electronic "folders."

You can also search using a wild card, specified by using a trailing equal sign (=) character. If you were to ask for Ch=, you might be pointed to folders on Chinese restaurants, chicken houses, and cheese stores.

DataFax can initiete e search using the Boolean logicel operators, AND/OR, to make further distinctions among identified sets. Using the restaurant detebase egain, you could search for "Chinese AND Manhattan" to find an oriental eatery in a particular place or "Italian AND Portland AND Parking AND Credit Cards" if you wanted to drive your car to Oregon for a pizza and leeve your cash et home. Similarly, if you're not overly particular, you could ask for "French OR Swiss."

The flexibility of *DataFax* allows you even greeter precision when searching files. You could ask for "Germen OR French AND Chicago OR Duluth." in this case, the parsing of the database syntax might give you more (or less) than you want. What this command would yield would be Chicago's German or French resteurants and every file (regardless of subject) on Duluth. In order to regain logical control, you heve to edd parentheses, just as in mathematics. Try: (German OR French) AND (Chicago OR Duluth).

The program includes a Sort command that allows you to order folders specified by alphabetical or numerical criteria. *Datofax*, however, sorts numbers from left to right, which could cause a prohlem. For example, a sequence of numbers beginning with 298 and ending with 297985 would be generated in the following order: `2978, 29784, 2979, 297985, 298, 2981.`

Operation

DataFax is written in UCSD Pascal and runs under the p-System opereting system. Run-time modules of both are provided with the package when purchased. This choice of languages presents both edvantages and disadvantages. The p-System is supposed to ellow for "transportability" from one computer to another; however, unless your other files (including word processors, spreadsheets, and other databases) are prepared with the same operating system, you will have to "translete" eech file from one operating system to the other. *DataFax* includes a transletion utility. The instructions, though, are vague at best. I was unable to make the translation program work until I called Link Systems for assistance. I did receive a courteous response from the woman in the technicel division. She answered my call, and volunteered an edmission that she was not familiar with the requirements of IBM DOS.

Until Link Systems improves the translation utility and the appropriete section of the manuel, I would hesitate to recommend the program to people who need to run DOS files under *DataFax*.

With the exception of the transletion features, the *DataFax* manual, presented in a padded binder with slipcase, is competent and comprehensive. It includes a useful index and table of contents, a reference-glossary, and a section on advanced techniques. A useful conversational tutorial walks the first-time user through steps of the program. The text in the manual, regretably, was prepared on a dot-matrix printer, an economy thet does not seem appropriate in an otherwise class act.

DATAFAX is written in UCSD Pascal and runs under the p-System operating system.

Starting from Scratch

The manual presents a clear explanation, spiced with a bit of humor, on the process of booting up the program disk. A minor compleint: It consistently refers to the disk drives as "1" and "2" rather than A and B as PC-DOS users are accustomed to. The program disk is not copy-protected and you may make backup copies for your own use. The system must be loaded with a Ctrl-Alt-Del reset or from a p-System prompt if you are already working with thet system. It cannot be loaded from the A>DOS prompt. The system produces a series of beeps and disk drive whirs with a very different cadence and sound from that of a DOS disk. I kept fearing the PC was undergoing a mechanical crisis during the 50 seconds it took to load my mechine.

In any case, the program does load, presenting the following opening menu:

```
S{etup a new data base
O{pen an existing data base
B{ack up a diskette
F{ormat or erase diskette
```

C{onfigure system
T{ranslate text files

DataFax can formet a new detabase disk without exiting to the operating system. This is en important feature, since the program essumes a nonstandard (for PC-DOS) format of ten sectors per track instead of eight. It allows an override if desired. The copy command includes an autometic verification of the copy as well.

DATAFAX can format a new database disk without exiting to the operating system.

The next step for the start of operations is the "Configure" menu. *DataFax* will read the switch settings on your PC and eutometically insert the memory of your machine in the default settings of the program. *DataFax* cannot use more than 128K. If your system bes more memory than required, you might consider using an electronic RAM disk that can operate under p-System.

After you beve set up your database, you can begin creeting folders. The opening screen displays e single line of text on it:

```
DataFax(2.4) New Exam Scan Print
Delete Keys AutoKeys Fils Load
Unload Quit
```

Typlng N for "new" creetes a folder. The command line at the top disappears and is replaced with en editor line at the bottom, whicb tells you:

```
[Editor: Page 1 of 1 Created:
unsaved
   Updated: never      Keys: nons]
```

The cursor appears et the top left of the page, and you are free to type anything you wisb onto the screen. *DataFax* lncludes a competent editor (see Figure 1). If the programmed editing functions don't suit you, you can redefine all of them, plus a few more, from e DatoFax menu.

There are three weys to identify keywords for the program. One allows you to mark them as you write. Just type the Ctrl X combination when the cursor is in the space to the right of whatever word you wisb to add to the list. The second alternative ellows you to go back into a document and type Ctrl X anywhere on the screen. The third way to identify e keyword is by typing Ctrl K at any time during editing. The screen is replaced by an alphabetized iist of current keywords. You are able to add or delete keywords directly—and you may convert any word or phrase not included in the document itself to a keyword.

THERE are three ways to identify keywords for the program.

All in all, *DataFax* is e not bad eddltion to your computer. With enough organizational resolve, it might belp you sweep the papers off the desk top and into a disk wbere they belong. Rumor has it, by the wey, that my desk top is brown . . . */PC*

Figure 1: DataFax editing functions (as delivered)

Move cursor left	Left arrow
Move cursor right	Right arrow
Move cursor up	Up arrow
Move cursor down	Down arrow
Teb cursor	Ctrl I
Home cursor	Home
Tab to next word	Ctrl W
Insert character	Ins
Insert line	PgDn
Delete character	Del
Delete iine	PgUp
Copy line buffer	Ctrl C
Erase line	Ctrl E
Erase screen	Ctrl R
Mark key	Ctrl X
Verify pege	Ctrl V
Jump to character	Ctrl J
Key menu	Ctrl K
Page menu	Ctrl P
Save page and exit	Ctrl S
Cancel edit	Esc

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Many individuel traders, lacking either a librery of rasaarch aids or e staff of clerks, make investment decisions based on speculetion or intuition. Others take e more technical approach; relying on statistical anelysis, they cull the finencial pages for prica quotes and volume fluctuations and turn newspeper summeries into elaborata algorithms or meticulous hand-drawn charts.

Thesa techniques may work, but when you are tied to tedious numerical calculations end frequent phone calls to brokerege houses, the job of guiding your invastments is bound to lose some of its eppeal.

Tha marriage of microcomputars and investmant software makes older methods of portfolio managament seem primitive by comparison. Although a computer cannot relieve an investor of the risk or effort involvad, it can simplify tha tesk and produce accurate and speedy results.

Bare-Bones Management

The simplest investment software may be nothing more than an accounting package. The selected equities are stored on a disk file, and es shares ara added or sold, the program recalculetes the current esset balence autometically. In eddition, it usually figures parcant or doller tebuletions for profit and loss results. A walldasignad template on an alectronic spreadsheet, however, could provide the same functions.

This type of bare-bones portfolio manegement is insufficient for most investors. More sophisticated investment software that can gain eccess to finenciel data banks through communicetion technology suits their needs better. With a modam, a microcomputer, and eccess software, e tradar can recaive the sama mainframe data services available to investmant firms

Illustration: Don Day

and financial institutions. Company profiles, corporate earnings, financial news, and market information can be obtained over telephone lines. Quotes on common and preferred stocks, corporate and foreign bonds, mutual funds, options, and treasury issues are available during market hours, usually with only a 15-minute delay. Portfolios are kept current by recording the day's closing quotes automatically and then calculating unrealized gains and losses.

WITH A modem, a microcomputer, and access software, a trader can receive the same mainframe data services available to investment firms and financial institutions.

More Sophisticated Software

Three more types of investment software currently on the market provide even more useful features. The first produces organized reports and presents the updated information in consistent, readable style. Its orderly documentation enables the user to see the transactions laid out neatly, resulting in wiser investment decisions.

A second type of investment software translates current and historical quotations into bar charts, graphs, and trend lines, making comparisons with other stocks and overall market performance. Such comparative charts based on common indicators are a necessary component of technical analysis.

Finally, the most complicated software package evaluates a portfolio by monitoring the momentum of stocks or by using fundamental screening tests such as price/earnings ratios, dividends, past growth, book value, and risk potential. This program takes the task a step further and actually suggests investment strategy and timely buying or selling points.

A Broader Perspective

The ultimate purpose of portfolio monitoring programs is to make the investor's task more manageable and to help him trade in the market profitably. Though a

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THE TYPE OF software you choose really depends on your investment style.

Ellen R. Wilson is on independent writer and a sales representative for Computer-Land of Marin in Novoto, Californio.

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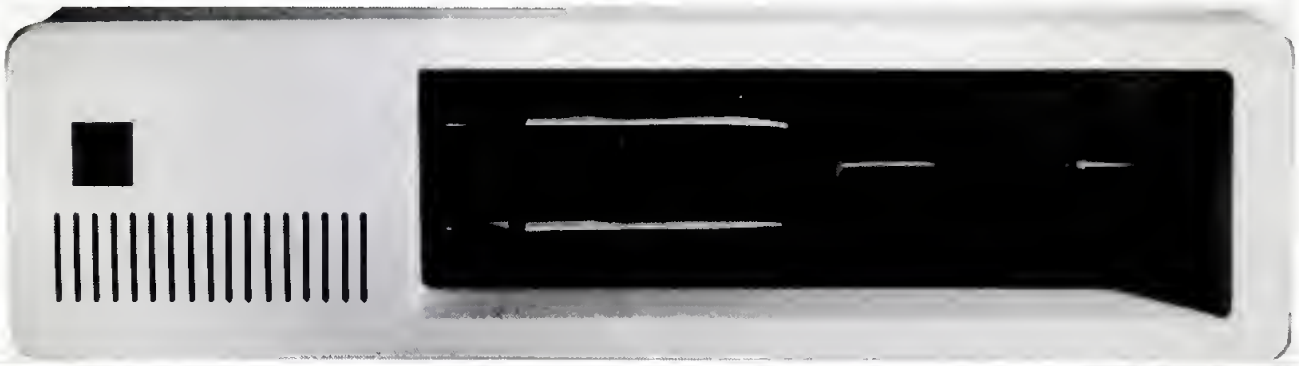

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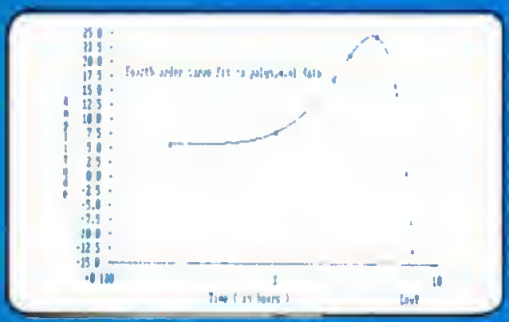

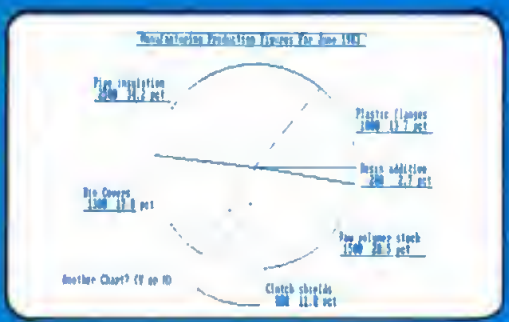

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Adam Smith's description of capitalism as an "invisible hand" applies equally well to the PC when it comes to digital evaluation of stocks and options.

Probing The Market With Investment Software

Slnce tha advent of the PC, independent compenies heve flooded tha market with various software peckages that promise to meke full use of the PC's capabilities, a promise most are unabla to keep. The seme is true of tha latast wava of speciel-ized programs to hit tha PC market: invest-ment softwere.

All of the invastmant software pack-ages reviewed below eliminate time-con-suming calculetion end enelysis and pro-vide tha basic information needed to meke invastment decisions. Yet eech lacks the cspebilitias needad to ancompass the full ranga of investment epplications.

The Ideal Package

What faatures should e comprehansive software packaga includa? First, it should provide more anelysis of longitudinal deta. It should track option and stock price movement over time and using this data, estimata tha rata of likely futura movemant. Such a progrem should auto-matically retrieve data from a mejor finan-ciel service such es Dow Jones and kaap an ongoing record. Finally, it should usa tha capebilitias of the PC to present the dete graphically in e wey thet would simplify anelysis.

The Personal Invastor
PBL Corp.
P.O. Box 559
Wayzata, MN 55391
(612) 471-7644
Source ID - TCT327

List Price: $145
Requires: 128K, two disk drives, mono-chrome edaptar or color grephics adapter. Modem and sarial async cerd required for Dow Jones News/Retrievel.

CIRCLE 589 ON READER SERVICE CARD

Personol Investor is e capable portfolio manegar. It can dial the Dow Jonas News/ Ratrievel Service or othar electronic news terminels, enter your privete password, end autometically collact tha most recent treding prices of the selected securities et the rate of tan items per minuta. It then stores tha informetion gethered for each security in tha appropriata portfolio records.

Updated Version

Personol Investor has also been up-dated to resolva ona of tha drawbacks mentionad in an eerlier reviaw ("Lifa Among the Bulls end Bears," PC, Volume 1 Number 7). The autometic quote retriev-ei function, previously eveiiebie oniy with common and preferred stocks, has been axpandad to includa bonds, mutuel funds, options, and treasury bills. In addi-tion, the updeted version stores purchese records in a Data Intarchanga Format (DIF) file, allowing the ticker symbol, purchasa dete, share cost, number of shares pur-chasad, current price, quarterly dividand, and ex-dividend date to be transferred to e VisiColc program without the need to re-entar informetion. The new Personol Investor also requires two disk drives, since e DIF file of all purchases is eutomat-ically writtan to Drive B. DIF files cannot be writtan to disks conteining elthar the program or portfolio data.

Tha procadure for edding securities is handlad ln tha same wey as in the original version. First, however, you must indicate the type of security being antered. This procedure is eccomplished in the Add/ Change screen by pressing the F6 speciel function kay. The typas of securities are then displeyed, and you type in the first lettar of your selection: (S)tock, (O)ption, (B)ond, (M)utuel Fund, or (T)reasury Bill. Insteed of requesting e stock symbol, the new screen will display the type of secu-rity chosen and prompt for its trading symbol.

Selling Short

By manipulating existing field entries, you can sall stocks and options short. A short sale is added to end displeyed with long stocks and is identified by entering S on the left side of the Number of Shares column in tha Add/Changa screen. It is sold on the purchase line end purchased on the sell lina. Options ere writtan (sold short) in the same manner. To let tha pro-gram know you are entering e short, press tha minus key (−) before entering the number of sheres (or in tha case of options, the numbar of contracts) sold.

This may sound confusing, but it really isn't. The Personal Investor's strength is its eesa of usa end the orderly reports it generates. As e portfolio menagar, It

Figure 1: Print-outs of purchase records from Personal Investor

U N R E A L I Z E D G A I N / < L O S S >

Today's Date 12/1/82 — Last Updated 11/29/82

Symbol	Description	S L	Purchase Cost	Current Value	Gain / <Loss> Short Term	Gain / <Loss> Long Term
IBM	Intl Bus. Machines		1792.00	2422.00		630.00
ASTR	Astroeystems		467.63	946.13	478.50	
NOM	Natomas Corp		508.25	313.50	<194.75>	
OXY	Occidental Petroleum		500.00	367.50	<132.50>	
TNDM	Tandem Computer		3887.81	5670.00	1782.19	
DYSN	Dysan Corporation		1737.50	1975.00	237.50	
DYSN	Oysan Corporation		1337.50	1975.00	637.50	
EC	Englehard Min/Chem		400.00	577.50		177.50
FTHRX	Fidelity Thrift		5024.88	4929.12		<95.76>
FEQIX	Fidelity Equity Inc.		5924.88	9490.78		3565.90
HRS	Harris Corporation		525.00	547.50	22.50	
XON	Exxon		498.88	724.75	225.88	
INTC	Intel Corporation		994.58	1147.50		152.92
CRVS	Corvus		2600.00	4150.00	1550.00	
IGAM	Intl Gaming & Mktg		502.50	712.50	210.00	
VR8	Verbatim Corporation		2787.61	16387.50	13599.89	
HM	Homestake Mining		0.00	4700.00	4700.00	
VAALY	Vaal Reefe Explor		1031.78	1780.00		748.22
PS8	Philbro		1575.00	2756.25	1181.25	
Total			32095.79	61572.52	24297.95	5178.78
				Total Gain/<Loss> of is		29476.73

O E S C R I P T I O N A N O P R I C E

Today's Date 12/1/82 — Last Updated 11/29/82

Symbol	Deecription	Purchaee Oate	No. of Shares	Purchase Price	Last Price	Commission
IBM	Intl 8ue. Machinee	5/1/74	28.0000	64	86 1/2	0.00
ASTR	Aetroeystems	12/8/82	87.0000	5 3/8	10 7/8	0.00
NOM	Natomas Corp	12/8/82	19.0000	26 3/4	16 1/2	0.00
OXY	Occidental Petroleum	12/8/82	20.0000	25	18 3/8	0.00
TNDM	Tandem Computer	7/10/82	180.0000	21 21/64	31 1/2	48.75
OYSN	Dysan Corporation	1/29/82	100.0000	17 3/8	19 3/4	0.00
OYSN	Dysan Corporation	3/18/82	100.0000	13 3/8	19 3/4	0.00
EC	Englehard Min/Chem	2/26/81	20.0000	20	28 7/8	0.00
FTHRX	Fidelity Thrift	7/5/78	504.0000	9 31/32	9 25/32	0.00
FEQIX	Fidelity Equity Inc.	10/21/76	422.0000	14 3/64	22 31/64	0.00
HRS	Harrie Corporation	12/8/82	15.0000	35	36 1/2	0.00
XON	Exxon	12/8/82	26.0000	19 3/16	27 7/8	0.00
INTC	Intel Corporation	7/10/80	30.0000	32	38 1/4	34.58
CRVS	Corvue	2/23/82	200.0000	13	20 3/4	0.00
IGAM	Intl Gaming & Mktg	12/8/82	60.0000	8 3/8	11 7/8	0.00
VRB	Verbatim Corporation	2/20/82	300.0000	9	54 5/8	87.61
HM	Homestake Mining	11/26/82	100.0000		47	0.00
VAALY	Vaal Reefs Explor	5/1/74	20.0000	50 1/4	89	26.76
PSB	Philbro	12/1/82	50.0000	31 1/2	55 1/8	0.00

requires an absolute minimum of effort. The flow chart menu makes the program's different functions easy to follow. It's an innovative concept, and more software companies should consider using this handy feature.

Updating Your Portfolio

Once the equities and their ticker symbols, purchase dates, prices, shares, and commission fees have been entered in the Add/Change Securities portion of the program, you only have to log-on to Dow Jones to update a a portfolio. The program stores trading volume, high/low and last prices, closing price, opening price, and net change. Information saved from the Over-the-Counter exchange includes volume, ask and bid prices, and spread calculations. In addition, *Personal Investor* maintains records of purchases and commissions, calculates net gains and losses, and provides a tax report of the sales transactions that includes profit and loss amounts and dividend yields (see Figure 1). Each of the program's five reports (Description, Quotes, Gain/Loss, Dividend, and Tax) may be printed. But the program will not run if the printer is either off or off-line, an important piece of information that is not mentioned until Section 16 of the manual.

Multiple purchases of the same stock are tracked and reported separately, and the number of purchases maintained for a particular equity is limited only by the number of purchases already stored on the disk. Price per share may be entered as a decimal or as a fraction, but it is con-

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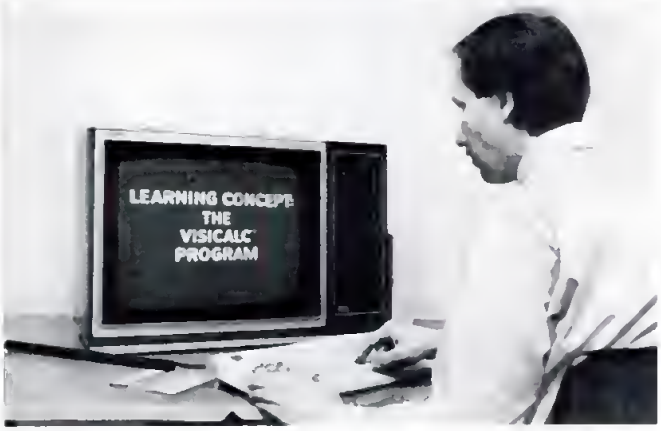

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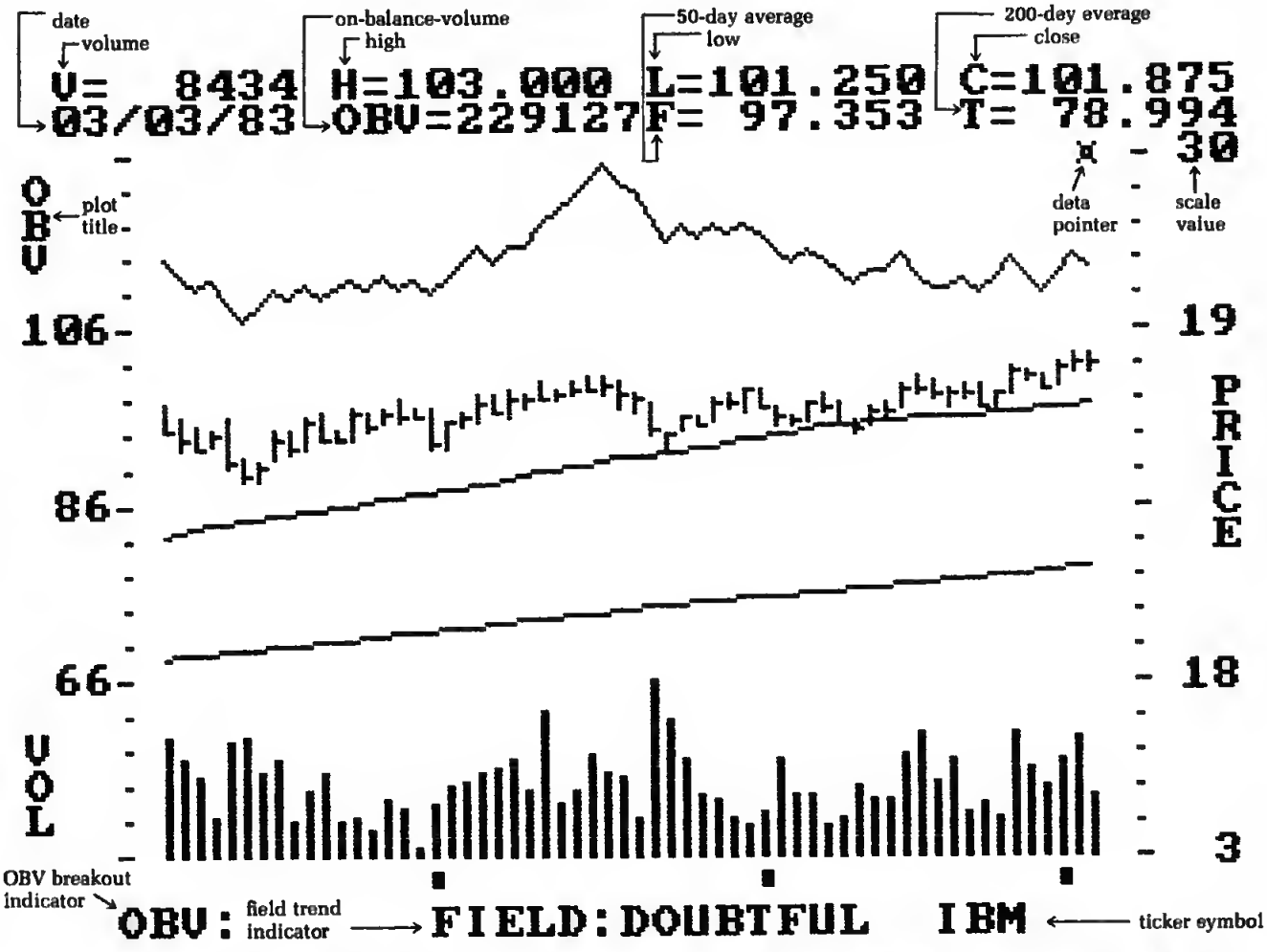
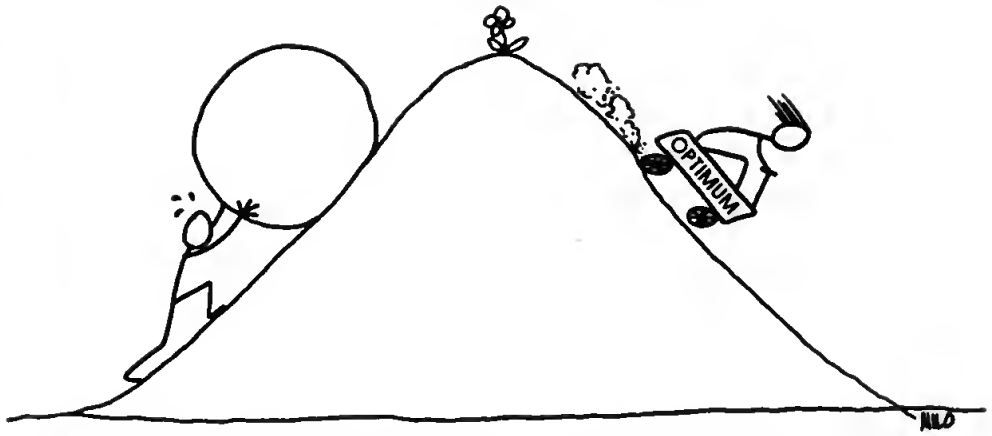
Figure 2: STOCKCHART-II graph indicating daily high, low, and closing stock prices



DATE	HIGH	LOW	CLOSE	VOLUME	OBV	INDIC	FIELD
12/08/82	97.500	94.500	94.500	13135	234592		DDUBTFUL
12/09/82	96.000	92.500	93.625	11185	223407		DDUBTFUL
12/10/82	95.125	92.375	92.750	9575	213832		DDUBTFUL
12/13/82	94.750	93.125	93.875	6542	220374		DDUBTFUL
12/14/82	96.250	90.500	91.000	12874	207500	DOWN	DDUBTFUL
12/15/82	91.500	89.125	89.375	13059	194441	DOWN	DOUBTFUL
12/16/82	91.250	89.000	90.750	9979	204420		DDUBTFUL
12/17/82	94.625	91.500	93.625	11430	215850		DDUBTFUL
12/20/82	94.625	92.000	92.500	6139	209711		DDUBTFUL
12/21/82	96.000	92.500	95.750	8701	218412	UP	DDUBTFUL
12/22/82	96.375	93.500	93.500	10148	208264	DOWN	DDUBTFUL
12/23/82	94.500	93.500	93.625	5900	214164		DDUBTFUL
12/27/82	96.875	93.375	96.375	6470	220634	UP	RISING
12/28/82	96.375	94.750	95.125	5375	215259		RISING
12/29/82	97.250	95.375	96.625	7999	223258	UP	RISING
12/30/82	98.000	95.750	96.125	7254	216004		RISING
12/31/82	97.125	96.125	96.250	3737	219741		RISING
01/03/83	97.000	92.500	93.000	7606	212135	DOWN	RISING
01/04/83	95.625	92.375	95.625	9110	221245	UP	RISING
01/05/83	96.750	95.000	96.000	9509	230754	UP	RISING
01/06/83	98.500	95.500	97.625	10242	240996	UP	RISING
01/07/83	98.375	96.500	96.625	10606	230390		RISING
01/10/83	99.250	96.000	98.000	11142	241532	UP	RISING
01/11/83	98.375	97.000	98.000	8509	241532	UP	RISING
01/12/83	100.125	98.000	98.125	15259	256791	UP	RISING
01/13/83	99.250	98.125	98.625	7350	264141	UP	RISING
01/14/83	99.875	96.500	99.125	8740	272881	UP	RISING
01/17/83	100.750	99.250	99.250	11447	284328	UP	RISING
01/18/83	100.375	98.500	99.625	10150	294478	UP	RISING
01/19/83	100.250	97.000	98.500	9687	284791		RISING
01/20/83	98.750	96.750	97.875	6278	278513		RISING
01/21/83	97.500	94.000	94.625	17851	260662		RISING
01/24/83	94.125	92.250	93.875	14775	245887		RISING
01/25/83	96.250	94.375	96.000	11336	257223		RISING
01/26/83	96.125	94.875	95.125	8425	248798		RISING
01/27/83	98.000	95.750	97.625	7926	256724		RISING
01/28/83	98.500	97.125	97.375	6338	250386		RISING
01/31/83	98.875	96.750	98.875	5742	256128		RISING
02/01/83	99.250	97.000	97.000	6602	249526	DOWN	RISING
02/02/83	97.250	95.250	96.000	11219	238307	DOWN	RISING
02/03/83	96.000	95.125	95.500	8164	230143	DOWN	RISING
02/04/83	97.500	95.375	97.375	8250	238493		RISING
02/07/83	98.375	96.625	97.125	5634	232859		RISING
02/08/83	97.375	95.000	95.125	6435	226424	DOWN	RISING
02/09/83	95.500	93.875	94.500	9127	217297	DOWN	RISING
02/10/83	96.875	95.125	96.375	7712	225009		RISING
02/11/83	97.750	96.000	96.375	7910	225009		RISING
02/14/83	99.500	97.000	99.000	11451	236460	UP	RISING
02/15/83	100.500	98.750	98.875	13528	222932	DOWN	RISING
02/16/83	100.250	98.250	98.375	9396	213536	DOWN	DDUBTFUL
02/17/83	99.000	97.000	98.375	11169	213536	DOWN	DDUBTFUL
02/18/83	99.500	98.250	98.625	6717	220253		DDUBTFUL
02/22/83	99.500	97.000	97.125	7464	212789	DOWN	DOUBTFUL
02/23/83	98.750	97.125	98.750	6396	219185		DOUBTFUL
02/24/83	101.500	98.750	100.875	13656	232841	UP	DDUBTFUL
02/25/83	101.250	100.000	100.375	10521	222320		DDUBTFUL
02/28/83	100.500	99.000	99.000	9106	213214		DDUBTFUL
03/01/83	101.875	99.625	101.750	11065	224279		DOUBTFUL
03/02/83	103.000	101.250	102.125	13282	237561	UP	DDUBTFUL
#03/03/83	103.000	101.250	101.875	8434	229127		DDUBTFUL

data listing
date marker



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verted, stored, and reported es e frection to remain consistent with the Dow Jones quote format.

Poor Recordkeeping

Unfortunately, Personol Investor does not retein any portfolio history. When e stock splits, the originel purchase record ls changed to reflect the new number of shares and the new per share price; only the purchase data remains in the historicel record. In addition, since each Dow Jones updete writes over the previous log-on date, daily records are not maintainad. When equities are sold, they are removed from tha list automatically end transferred to the tax report.

Suggestions For Improvement

Although Personol Investor is a well-structured program, a few features should be edded. For exampla, the program conteins no elphebetic sort feeture, end enyone monitoring a large portfolio may have to hunt for a particular item among the printed listings, which appear in the same ordar as thay are entered. Sinca 700 purcheses and up to 300 stocks can be stored on ona data disk, tha ability to print out a sizable portfolio in elphebetical order seems mandetory.

Although the program contains a field for tha ax-dividend deta, no provision is mada for adding a ticklar data or for flegging a particular item. For example, you cannot maintain an opan ordars log to note which ordars are "Good Till Canceled." As for the omission of e tickler file, evan smell investors would find this feature useful as a reminder of an annuel meeting, e quartarly earnings report, or en expiration data of an option.

A graphics generetor would elso be e welcoma eddition to the program, beceuse successful investing more often results from relative comparisons rether than from absolute values. Since the program does not meintain e deily price record, even the DIF feature cennot be transferred to plot price fluctuetion or volume without re-entering the data manually.

The Price Is Right

Personol Investor's $145 price teg includes a standard Dow Jonas subscription and password—a $50 velue—elong with e free hour of nonprime time usage. Depending upon the service selected, this free hour can ba worth anywhere from $12 to $54. Thus, tha program pays in part for itsalf.

The updated version includas tha original manual end e 12-page addendum outlining changes made in the program. Owners of tha original version may purchase tha updata for $10 but should be prepared to re-entar thair portfolio deta on the new data disk.

Stockchart-II
Micro-Investment Software
9621 Bowie Way
Stockton, CA 95209
(209) 952-8833
List Price: $500
Optionel Annuel Meintenance Fee: $75
Requires: 128K RAM, two disk drives, asynchronous communicetions adapter and modam, color graphics adapter, color monochroma monitor, dot metrix printer.

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Stockchort-*II* is a market graphics package designed specifically for performing technical analysis. The program automatically connects tha PC to the Dow Jones News/Retrieval Service to update stock portfolios. After the daily quotas hava been retrievad, the program will calculete the

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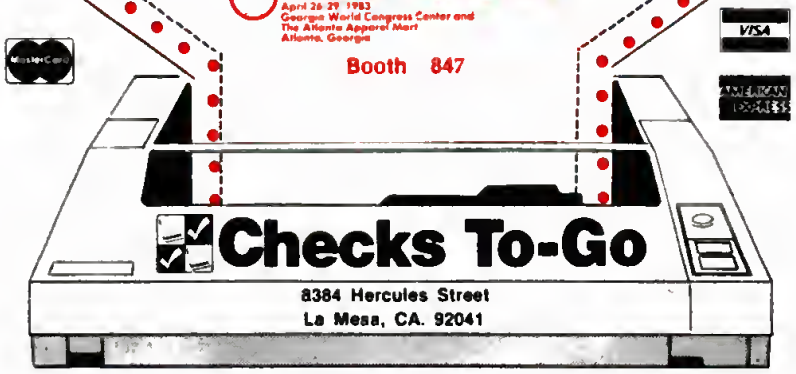

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50- and 200-dey moving averages and the on-belance volume. In eddition, it will analyze the stetistics for volume breakout and indicete current field trends. After all the calculetions have been complatad, you can use the progrem's grephing capabilities to generete charts thet plot daily high, low, and closing stock prices (see Figure 2). Moving everages end daily and on-balance volumes mey elso be plottad. In eddition, StockChort-*II* has been expandad to includa OTC stocks end warrants.

StockChort-*II* appears to be weighted toward technicel treders who are more interested in spotting trends than in monitoring papar profits and losses. The program is not intanded for portfolio menagement; it cennot be used to record purchase amounts, commission laes, or sales informetion.

Invastors who subscribe to stock market analyzer Joseph Grenville's "on-belance volume theory" should welcome this program. Granville's postuletion is that price trends can ba detected by following imbelences of supply and demend.

Disk Swapping

Getting started requires e bit of confusing disk swapping and copying.

Stockchart-*II* comes with two disks; the first conteins the mestar program and the second ects es the utility disk. Since tha files will fit onto one double-sided floppy, and since two edditional data disks are required to use the program, you should probebly copy the master files onto the sama disk.

Each data disk allows you to monitor a maximum of 20 stocks. In order to do this, you must sat up a disk conteining the communicetion informetion (beud rate and password), then connact it with the Dow Jonas News/Retriaval Service. This disk will be usad to collect current and historical quotas. According to the documentation, up to 264 deys of quote information cen be retrieved.

On tha second date disk, you must enter the ticker symbols and company names. This inIormation is then copied to the quotes disk. Sinca Stockchart-*II* does not monitor gains/lossas or dividands, no provision is includad for entering purchese information. When the maximum of 20 stocks has been entered, you ere givan the choica of saving or discarding your antrias.

Drawbacks

Stockchort-*II* employs IBM's special function keys, and the use of eech is carefully described in the documentetion. Although it updates stock quotes autometically, the program does not include subscription to the Dow Jones News/Retrievel Service end data may not be entered manuelly. Thus, Stockchort-*II* cannot be used to retrieve financial news, corporate earnings reports, and othar typas of information eveileble from Dow Jonas.

Graphics Capabilities

The strength of tha program lies in its graphics capebilities. Graphing the deily price and volume totals with Stockchart-*II* provides a dynamic imaga of trends that cannot be achievad by looking at rows or columns of numbers. Running the progrem is not a simpla tesk, howaver, becausa aach updata requires three disks. Furthermore, dumping tha date to the printer takes e minimum of one end one-half minutes. If you are tracking 20 stocks, the time you will spend using Stockchort-*II* is extensive, unless compared to the time and the tedious work that would be

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required to produce the calculations end charts menually.

Although Stockchort-II's herdware requirements seem hefty (double drive systam with 128K RAM, asynchronous communication adepter end modem, color graphics adapter, color or monochrome monitor, dot matrix printer with graphics capabilities), its configuretion is now almost standard, as evidencad by the development of the PC XT. It elso conteins no speciel system call thet would affect its ablity to function under DOS 2.0.

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STOCKCHART-II appears to be weighted toward technical traders who are more interested in spotting trends than in monitoring paper profits and losses.

In order to run the program, you manuelly entar date such es transection date, call prica, strika prica, stock price, option expiration date, and commission cost. The program then outputs the emount of time remeining on the option, the option price et which profits start, end the price at which undarlying stock must be sold at expiretion in order to make the trade profiteble. To determine how well the stock must perform over time in order to make a profit, the program provides either a percentage increasa ovar the life of the option or es en annualized percantage increase.

In a similar fashion, the program handlas the purchese of puts and can give basic informetlon on the more complex transections of streddles and spreads.

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Actual INTELLICOM menu is illustrated below.
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A - Ascii file transmission.
B - Ascii file transmission - PTR/PTP protocol.
C - Ascii file reception - PTR/PTP protocol.
O - Toggle local display (on).
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Z - Invoke Disk/File function menu.
E - Exit program.

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cised, Options will calculete the rete of return.

Inexperience Necessary

Since the program can only be used to organize and compute fundamentel dete, it is best suited to the inexperienced or the occasional options treder. A more experienced treder could probably meke most of these calculetions in bis heed. Options provides only e limited cross-sectionel view at a particular point in time. Since it does not use the price histories of the stock or the option, it is unable to perform more sophisticated analyses.

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Although COTS provides a great deal of the rew informetion, it does not provide any inherent trading strategy, but rather, allows an investor to formulate and monitor any of a range of strategies.

Fair Value

Written in BASIC end based on the well-accepted Black-Scholes model, COTS can be used to predict the future volatility of an option in order to determine its feir velue or its chance of success in the merket. Using the closing prices of individual commodities for the past 120 deys es dete, the progrem computes fair value, time value, intrinsic value, and probable range of commodity prices at option expiration. This information is then expressed in easy-to-follow graphs and tables.

Option Strategies

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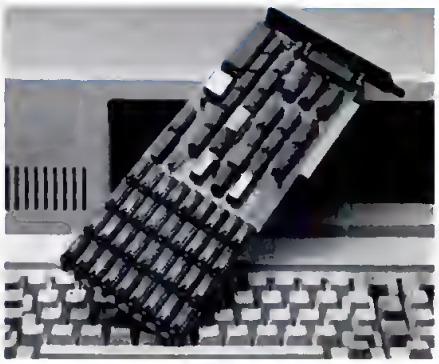

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determine the expected rate of return on these transections. It elso celculetes an annualized rate of return on various trading stretegies and predicts net profit end loss.

The package is very eesy to use and the grephic representation mekes analysis very streightforwerd. These can be displeyed on e green screen (not the IBM monochrome, unfortunetely) or on an RGB color monitor. At the time of this eveluetion it was not possible to dump the content of the screen for hard copy, but this cepebility will be added by the manufecturer soon. The other item (expected but not yet eveilable) is a communications enhencement that permits automatic entry of settlement price through a 300-baud modem. This is essential for tracking large numbers of commodities.

A Useful Tutorial

The documentetion for *COTS* is well-organized and, considering the complexity of the topic, it is surprisingly eesy to understend. The documentation, combined with the easy-to-follow color grephics, serves es e useful tutoriel for the less experienced. Since the program deals primarily with e specielized aree of investment enelysis, however, it will probably be more appeeling to the seesoned investor or the professionel treder. Its price is more reesoneble for this group rather than for anyone who debbles with a bit of risk capitel. Nevertheless, it is a very good peckage and cen be es simple or complex as the needs of the user. Some may consider *COTS* too expensive but, in the purchese of investment software, only the individuel cen determine wbet is "fair value."

THE RAPID appearance of COTS is reminiscent of the time after the IBM-PC was first announced when a few well organized groups were ready to market support items within months after its release.

Hope for the Future

These ere only a few of the investment progrems thet are presently available for the PC. Meny new programs are under development. The stock market is not a very forgiving plece, and software that provides orgenizetion, timely deta, end enelytic cepebilities should be part of a serious investor's library.

Caveat

Stocks shown in the reports are not included es recommendetions to the readers, nor ere they intended to present a balenced portfolio. The examples that were selected ere heevily bieeed toward high-riek, high-technology equities. */PC*

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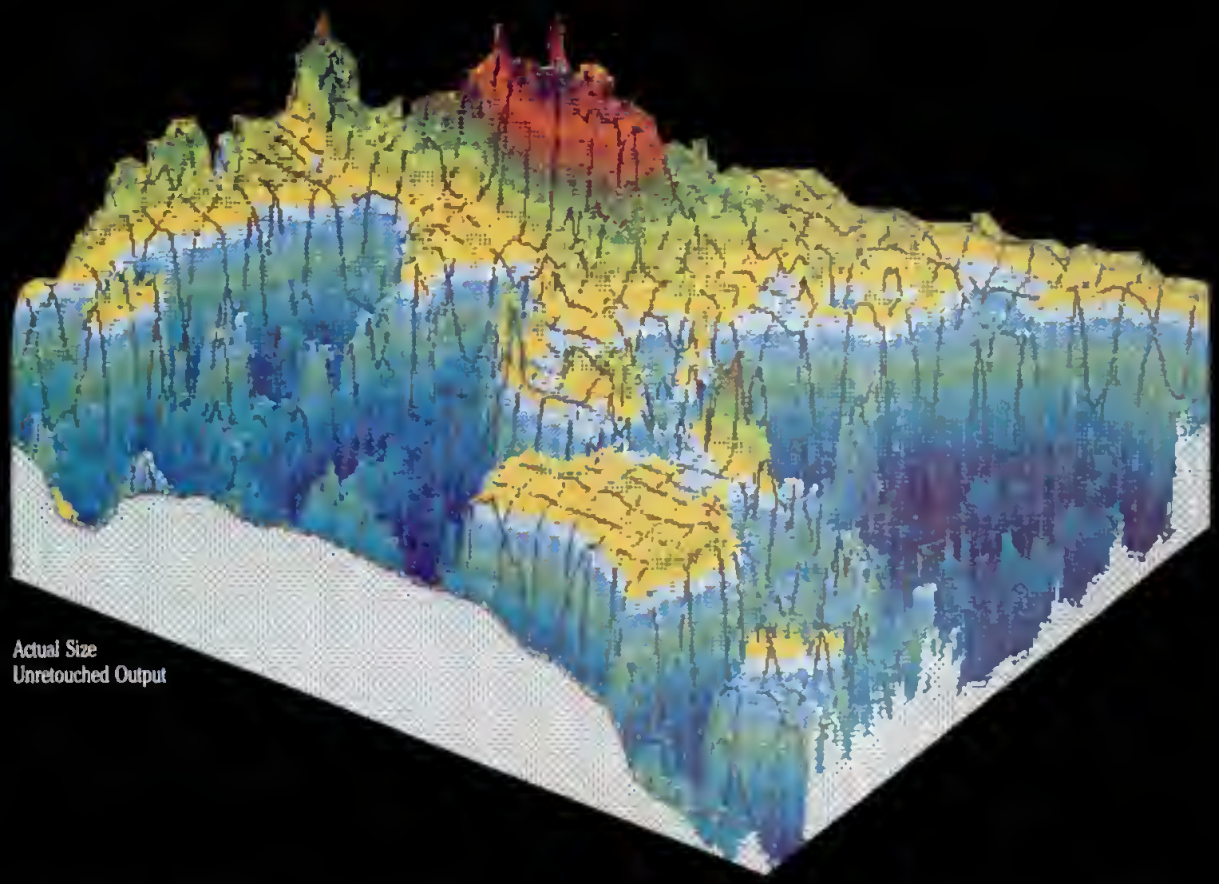

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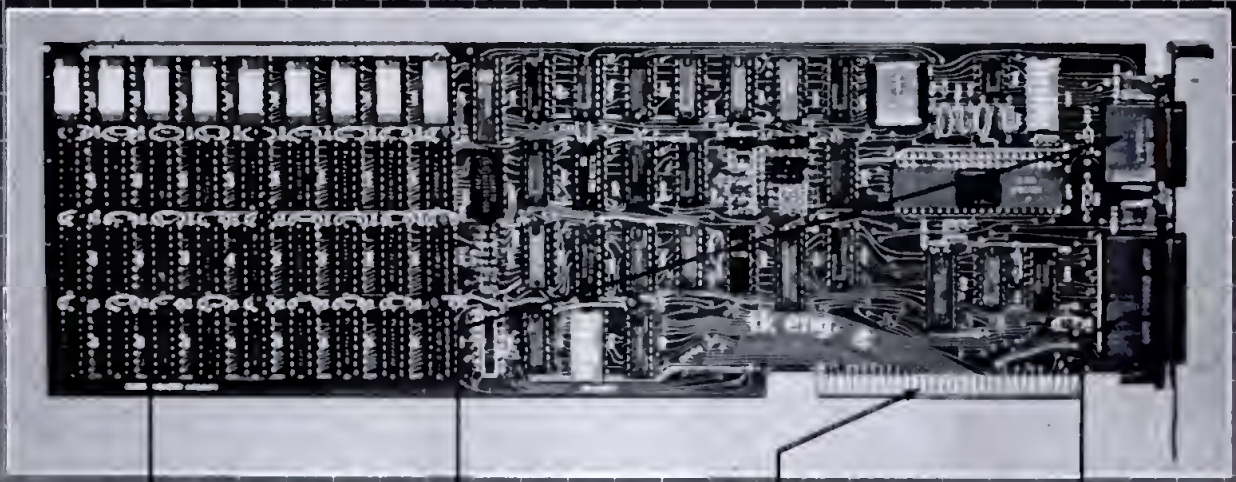

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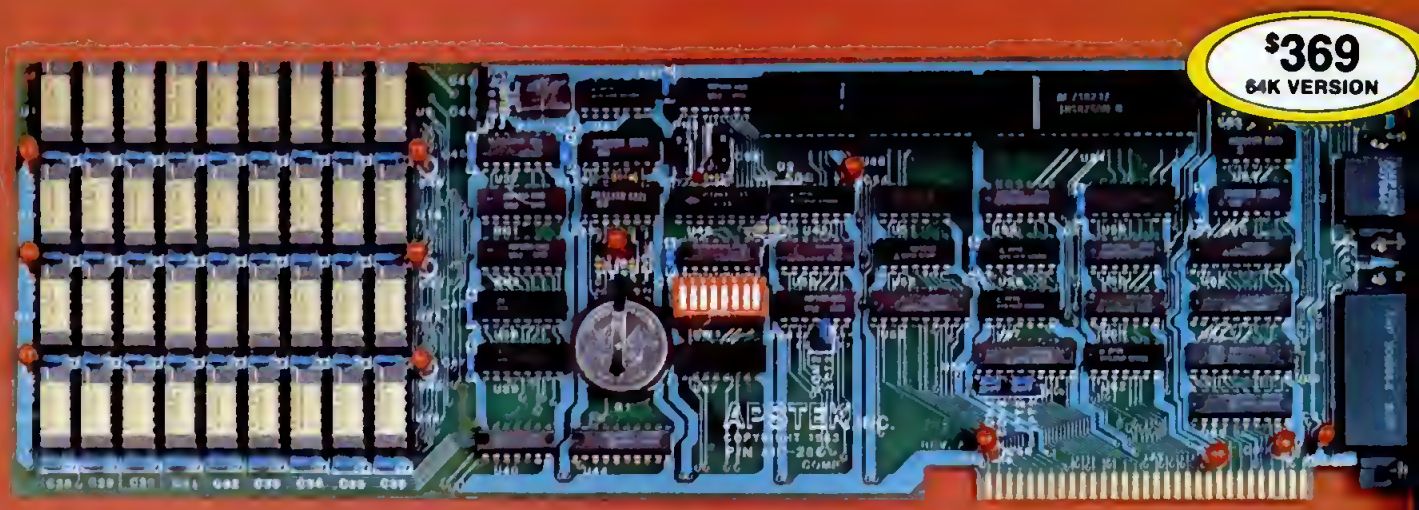

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The PC gives you the means to play and compose music in a way that J.S. Bach, Benjamin Franklin, and Stephen Foster could only have dreamed of.

A Musical "Invention"

The potential of the IBM Personal Computer for word processing, spreadsheet, data base, and graphics applications has been eagerly exploited by users and programmers. In comparison, the PC's ability to play music has remained one of its best kept secrets. If you've never thought of your PC as a musical instrument, instructions in this article could start you playing your first computer melodies—even three-part compositions.

Speaking of secrets, the following scene from the past should illustrate the proud musical heritage of the Personal Computer.

A Note From the Past

The year is 1749. The setting, the music room of the Thomasschule in Leipzig, Germany. Instruments of all kinds clutter the room: harpsichords, clavichords, violoncellos, violins, and the ultro-modern pedal harp. Against one wall is an enormous keyboard contraption with foot pedals and a monitor screen. From one side of this ungainly instrument protrudes a monstrous trumpet-like appendoge.

The occosion is an interview with the school's resident cantor and organist, one Johann Sebastian Bach, who has recently become a celebrity following a performance of his "Fugue in D minor for Three Harpsichords with Pocket Comb Continuo" in Munich. The composer, a flamboyant little man in his late 60s, poses proudly in front of his massive instrument. He's wearing baggy peach-satin breeches over white hose, topped by a worn velvet doublet of mauve, from the front of which cascades a jabot of slightly soiled lace. His crimped and powdered wig, a trifle askew on the balding forehead, has left powdery troces on his velvet shoulders.

Conducting the interview is a 43-year-old American visitor by the name of Benjamin Fronklin, publisher and editor of the Pennsylvania Gazette. A cheerful, pudding-faced man, his sparse hair drawn back at the nape with a grosgrain ribbon, Fronklin is dressed simply in brown serge and wears metal-rimmed half-spectacles. He exudes an auro of home-spun Colonial simplicity.

"Well, Herr Bach, or is it Professor Bach—?"

"Please, just call me Johonn."

"Shall we begin? I'm sure our readers in the Colonies would like to learn something abaut your musical genius, and the methods you use to preserve it for posterity. For instance, your new Fugue in D minor. You omazed us by performing it

Illustration: Don Dey

without written music. Can you tell me, was it scored in the conventional European manner, or by solfeggio, or do you have your own shorthand method?"

Boch smiles modestly and reaches out to stroka reverently the object of his pride. "You see this machine? This revolutionary electronic marvel will one day ostound the musical world! This machine I hove myself built from spare parts ond connected to my own generotor. With it I compose my fantastic fugues, my captivoting cantatas, my soaring symphonias."

"Incredible. Especially since electricity hasn't yet been discovered. You know, I've recently been wondering whether a kite string and a metal key might ... hmm. You say this machine of yours is electronic? What do you call it?"

"P.C."

"P.C.?"

"Precocious Clavichord."

"Catchy. It sounds like an offspring of your Well Tempered Clavichord. And how does it work?"

"Well, on this keyboard you punch out the melody and store it in the memory.

THIS revolutionary electronic marvel will one day astound the musical world.

Same with the harmony, then the bass. When all is stored, you simply push this RN key."

"And do the foot pedals control the volume?"

"No, dumkopf. You pump those to run the generator."

"And what's this you've got going on the side?"

"Gott in Himmel, Yankee whippersnapper! You traveled 4,000 miles to pry into my love life?"

"No, no—I mean this trumpet thing."

"Ah, yes, my Heidel-Horn. Very user-friendly. The music, it comes out from the Heidel-Horn, loud and clear. We use it for fire-shrieken also, and for summoning the kinder to class from their homes."

"Very impressive. No, no, don't bother to demonstrate. You have a fairly large family of your own, I understand?"

"Fairly. Seven kinder from my first wife Maria. And just when I was getting the hang of it, she up and died. Kaput. Then 13 more kinder from my second wife Anna. That is ... how do you Colonists say it?—a butcher's dozen!"

"Baker's. Unbelievable! 20 children. So prolific, and with your music, too. All those concertos, sonatas and cantatas."

"Ah, wait until you hear my latest! Day and night and in-between I've been working. I call this masterpiece, 'Concerto in G Flat for Flugelhorn and Flute, With Counterpoint by Gut-Bucket.' In the second movemant there's a moving solo passage for the kozoo. It's enough to make you cry."

"I can well believe it. About how long does it take you to write a composition of this calibre?"

"On the P.C.? Oh, years and years. You see, the kinder, they also use my P.C. day and night. They've invented this game where they shoot down invaders from France, with sound-effects on the Heidel-Horn. Care to try it?"

"Some other time, perhaps. I must run to catch that 2 p.m. packet. But thank you ogain, Johann, you've been most kind. With an in-depth interview like this, I'm sure our circulation will triple. I'll send you a teor sheet."

"Very kind. And you represent, again?"

"The Pennsylvania Gazetta."

"Ah, yes, one of my favorites. It's that peppy dance number in 4/4 time?"

"Not gavotte, gazette. Gazette!"

"Gezundheit."

It could have happened. Franklin tha inventor and Bach the composar wera contemporarias. Bach did in fact have 20 children by his two wives and was rather unconventional, for his staid time, with musical experimants. Not content with his two concertos for violin and orchastra, ha went on to write a concerto for two violins and orchestra, four concartos for harp-

TO COMPOSE —or even catalog—so much music, Bach would have needed a computer.

sichord and orchestra, two concartos for two harpsichords and orchestra, and two concertos for three harpsichords and orchestra, as well as hundrads of cantatas, preludes, fugues, sonatas, toccatas, etc., for various combinations of voices and instruments. To compose—or evan catalog—so much music, Bach would have neadad a computar.

In the early 1800s, digital and analog computers were brainstormad, but never constructed. Unrecorded inventions could hava occurred earlier. And Bach kept up with the stata of tha art in musical instruments; he was one of the first musicians to try playing a prototype piano.

On the IBM PC, programming and playing music is much simpler than with Bach's legandary contraption. For one thing, thare's no pedal-pumping needed to boot up the system; for another, the Heidal-Horn is less obtrusive. Tha quality of the music produced on tha PC will never make Carnegia Hall however, particularly in the buzzy lower registar. If you're composing for postarity, it might be safar to avoid tha lower octaves.

Composing in BASIC

The Play command in Advanced BA-

SIC (BASICA) is used for music. Advanced progremmers able to write their own languages would be capable of Inventing meens to produce better-quality music than is possible with BASIC, however.

In BASIC, the notes themselves are indicated by the letters A through G; each octave sterts with C and ends at B. To indicate a sharp, a # symbol or + is used after the letter; a − indicates a flat.

L, followed by e number, indicates the length of each note. L1 is a whole note, L2 a helf note, L4 a quarter note, and so on. The number length may range from one to sixty-four. A series of notes may be written F4E8G2. F4 is the same as L4F; both mean "play the note F as a quarter note."

A dot after a note has the same meaning as in written music; the note's length is Increesed by helf of its value. For instance, G1 will play G for the length of a whole note and a half note run together.

MN stends for Music Normel, meaning each note will sound for ⅞ of the time specified by L, this results in a slight pause between each note. MN is the default, but ML or MS can be specified.

ML indicates Music Legeto, meening each note will sound for the full period set by L. When this is In effect, adjacent notes on the same pitch will be run together without a break in sound, like tied notes.

MS indicetes Music Steccato, meening each note will play only ¾ of the time specified by L. The effect is similar to pizzicoto on violin.

N indicates Note, ranging from 0 to 84. On the PC there are seven possible octaves, for a total of 84 notes, only four less than the piano keyboard.

O indicates Octave. There are seven octaves, 0 through 6, each starting with C and ending with B. Octave 3 starts with

MUSIC
Normal results in a slight pause between each note.

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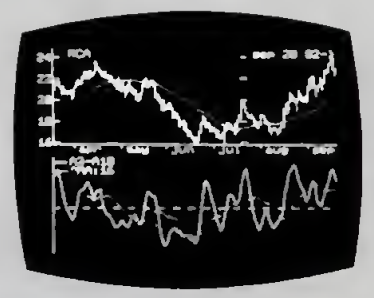

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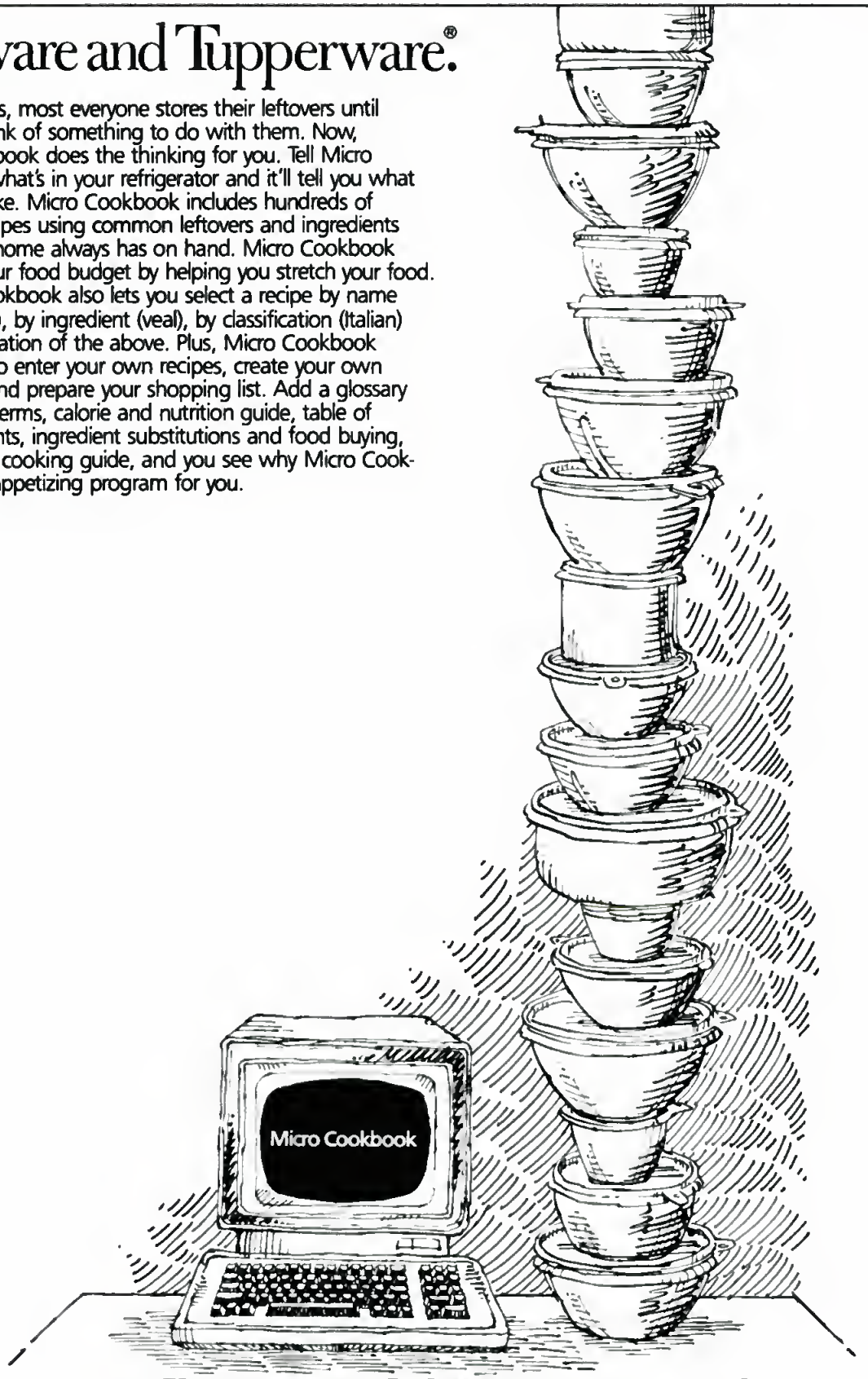

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igure 1: *BASIC statements for a three-part version of "Beautiful Dreamer."*

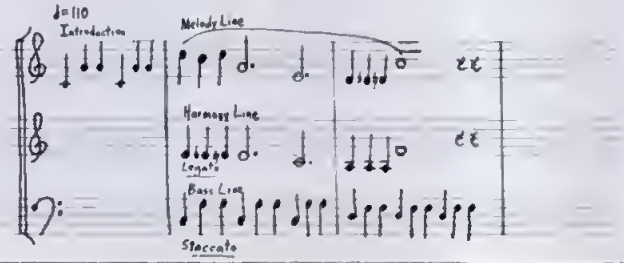
lelody Line
```
LAY "MLT11004C4O3B4O4C4O3G2.E2.D4D-4D4A1"
```

larmony Line
```
LAY "MNT11003E4E-4E4E2.C2.O2A4A4A4O3F1"
```

ass Line
```
LAY "MST11002C4G4G4C4G4G4C4G4G4D4F4F4D4F4F4D4F4F4"
```

ıtroduction to Melody Line
```
LAY "MNT11003C4G4G4C4G4G4"
```

igure 2: *Musical notation of "Beautiful Dreamer," equivalent to the BASIC tatements in Figure 1.*



Middle C. Be sure you use the letter O, and not the numeral 0, when keying in an octave change. The octaves you'll use most will probably be O2 and O3, as they have the best fidelity. Very high notes (above Octave 4) are apt to be tweety, end low ones (below E in Octave 1) tend to growl and be off-key, at least through the tiny speakers in the PC.

P indicates Pause or rest. You indicate the duration of Pause in the same way as L, from 1 to 64. (P4 would be a quarter-note rest.)

T indicates Tempo, setting the number of quarter notes in a minute, from 32 to 255. The default is 120. As an example of the use of tempo, escending 16th notes on ML at a T250 speed produce an approximation of e run or arpeggio.

If you find stanzas that repeat throughout a song, you can use If/Then/Else statements to repeat strings you've elreadv written.

Switched-On Foster

If Stephen Foster had written his "Beautiful Dreamer" on the PC, he might have sterted out the melody line with the BASIC statement in Figure 1.

```
PLAY "MLT11004C4O3B4O4C4 etc."
```

ML is for legato (smooth and connected); T110 is the tempo, fairly slow since it's a gentle waltz. O4 is the octave we start with. C4 is the first note of the song, a C pleyed as a quarter note. Since the following quarter note, B, enters a lower octave, it must be preceded by O3. The next note is the original quarter note C in Octave 4, followed by a G in the lower octave. Each time a note appears in a different octave, the change must be indicated.

The notation D-4 is for a D Flat quarter note. Since D Flat is the same as C Sherp, this note could be keyed in as C#4 or as C+4.

A harmony line to be played with this melodic phrase also might be e BASIC statement (see Figure 1).

THE octaves O2 and O3, have the best fidelity.

```
PLAY "MNT11003E4E-4E4 etc."
```

The Music Normal command ("MN") keeps the repeeted notes ("A4A4A4") from being run together without a break.

Now for the bass line (see Figure 1).

```
PLAY "MST11002C4G4G4 etc."
```

"Music Steccato" makes these notes sound like a nice, crisp "oom-pah-pah" bass.

A short introduction to the melody can be used as a coordinator, which will help when you put together the three parts on a

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recording.

```
PLAY "MNT11003C4G4G4C4G4G4"
```

Naturally, the same tempo is maintained in all parts that you plan to put together. Here the tempo is T110—that is, 110 quarter notes per minute.

All Together Now

To record your PC music, you'll need to set up two music-quality tape recorders near the computer. You might borrow one from a friend, in return for a recording of your original computer music. Now follow these steps to put the musical parts together.

IF YOU'VE synchronized properly, the melody line and the harmony line will perform at the same time.

1. Have two music-quality tape recorders ready to record, next to the PC.

2. Program your melody line on the PC, beginning with the introduction. (This intro will serve only as a lead-in to prompt you where to start the next recording.) Play the intro several times until you're familiar with the sound of exactly where it ends.

3. Record the introduction and the melody line on Tape Recorder #1 (T.R.#1). Rewind the tape.

4. Program the harmony line (without intro) on the PC. Have it set up ready to Run. (If it's written as a numbered program listing, be prepared to press Run. If it's a single unnumbered line (immediate mode), position cursor at end of line and prepare to hit the Return key.)

5. Set up Tape Recorder #2 (T.R.#2), ready to record sounds from both T.R.#1 and the PC.

6. Start recording with T.R.#2.

7. Play the introduction and melody line on T.R.#1, listening carefully for the exact end of the intro. At that moment, RUN the harmony line on the PC. If you've synchronized properly, the melody line and the harmony line will perform at the same time, and be recorded on T.R.#2. If not, after rewinding both tapes, repeat steps 6 and 7 until your recording is properly synchronized. Play back T.R.#2 to hear if the balance is correct. You may need to change the volume settings on the recorders or adjust their distance from the PC. When the two parts are correctly recorded on T.R.#2, then rewind the tapes.

8. Program the bass line (without intro) on the PC. Have it ready to Run.

9. The combined melody/harmony recording is now on T.R.#2, so T.R.#1 is free to record again. Make sure it's rewound and ready to record.

10. Start recording on T.R.#1. Play the melody/harmony recording on T.R.#2, listening for the intro. At the exact end of the intro, Run the bass line on the PC. If the two machines didn't synchronize perfectly, rewind and repeat steps 9 and 10 until the musical parts coordinate to your satisfaction.

You now have recorded a three-part harmonic composition, created with your PC. Additional counterpoint and extra bass parts may be added as you wish, by repeating the same process.

Fairly simple? If you made no errors in the timing (and they'll be easy enough to correct after hearing them on the playback), the three parts should fit together like an assembly-line VW. If it's a Cadillac you're expecting, you might be better off doing your composing on a studio-quality synthesizer—or a Steinway Grand.

Although chances are slim that a big record company will beat your door down clamoring for your computer music, there are advantages in using this new instrument. Once you get the hang of it, computer composing is faster and easier than conventional scoring. Your errors show up immediately, you can revise scores easily at any time, and you can have a printout at the press of a button. And it sure beats composing on a clavichord with a pedal-powered generator and Heidel-Horn. Bach never had it so good. */PC*

Bunny Hommerslo is o professionol ortist who runs o gollery in Edmonds, Woshington. She ploys piono ond occordion, in oddition to the Personol Computer.

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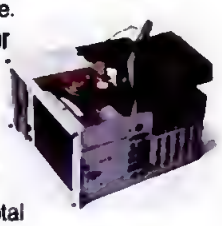

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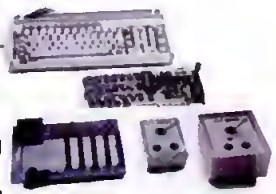

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*Price includes 9" high-resolution display, power supply, 15" x 17" x 8½" case with handle and interface boards. Does not include items transferred from the IBM-PC (disk drive, system board, plug-in boards, keyboard). Dealer inquiries welcomed. ©Copyright 1982 Colby Computer/A Division of Colby Research Industries, Inc.

CIRCLE 179 ON READER SERVICE CARD

An agricultural spreadsheet program not only aids farmers with their crop forecasting, but provides a model for other business applications.

Harvesting Profits With The PC

AgDisk Crop/Livestock Profit Projector
Harris Technical Systems
P.O. Box 80837
Lincoln, Nebraska 88501
(402) 476-2811
List Price: $120
Requires: 128K, two double-sided floppy drives, monochrome or color grephics edepter. Color grephics edepter required for on-screen charts. Printer optionel.

CIRCLE 577 ON READER SERVICE CARD

This is a spreadsheet for the spread, for those who want to count their chickens before they're hetched. The *AgDisk Crop/Livestock Profit Projector* is a quick and easy wey to tote up profit and loss on the increasingly computerized American farm.

Actuelly, this generally well-designed and implemented peckage should be viewed es e model for elmost any sort of consumer financial prediction, spreedsheet or "vertical" specielized program. It is easy to see how the besic shell of the program and its eccompanying documentation could be edepted to predicting the profitebility of a hamburger stand or e printing plant or most any other fectory thet goes from raw material to finished product.

The *Crop/Livestock Profit Projector* includes an attrectively peckaged and well-

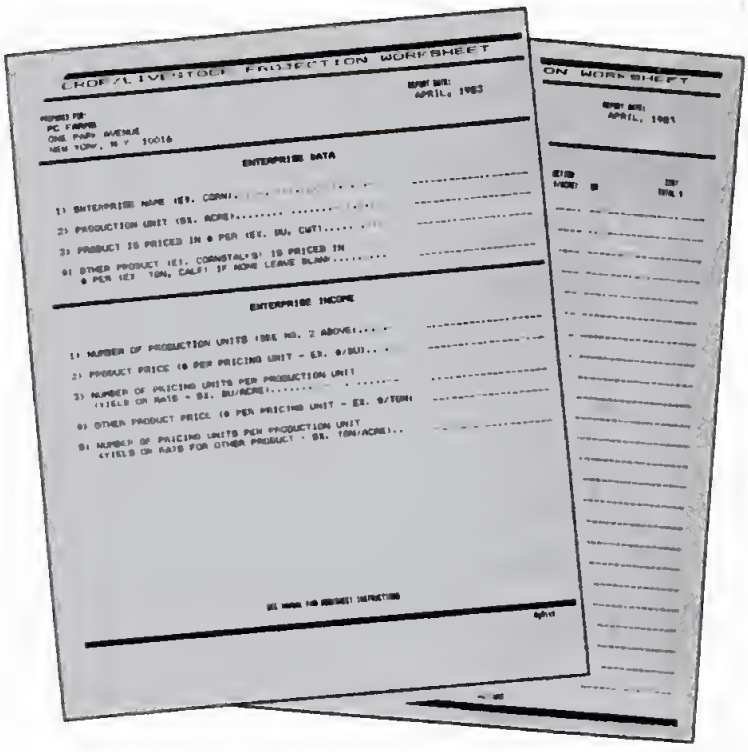

Figure 1: The AgDisk Crop/Livestock Profit Projector can produce printed copies of the informotion required for its ogriculturol spreadsheet.

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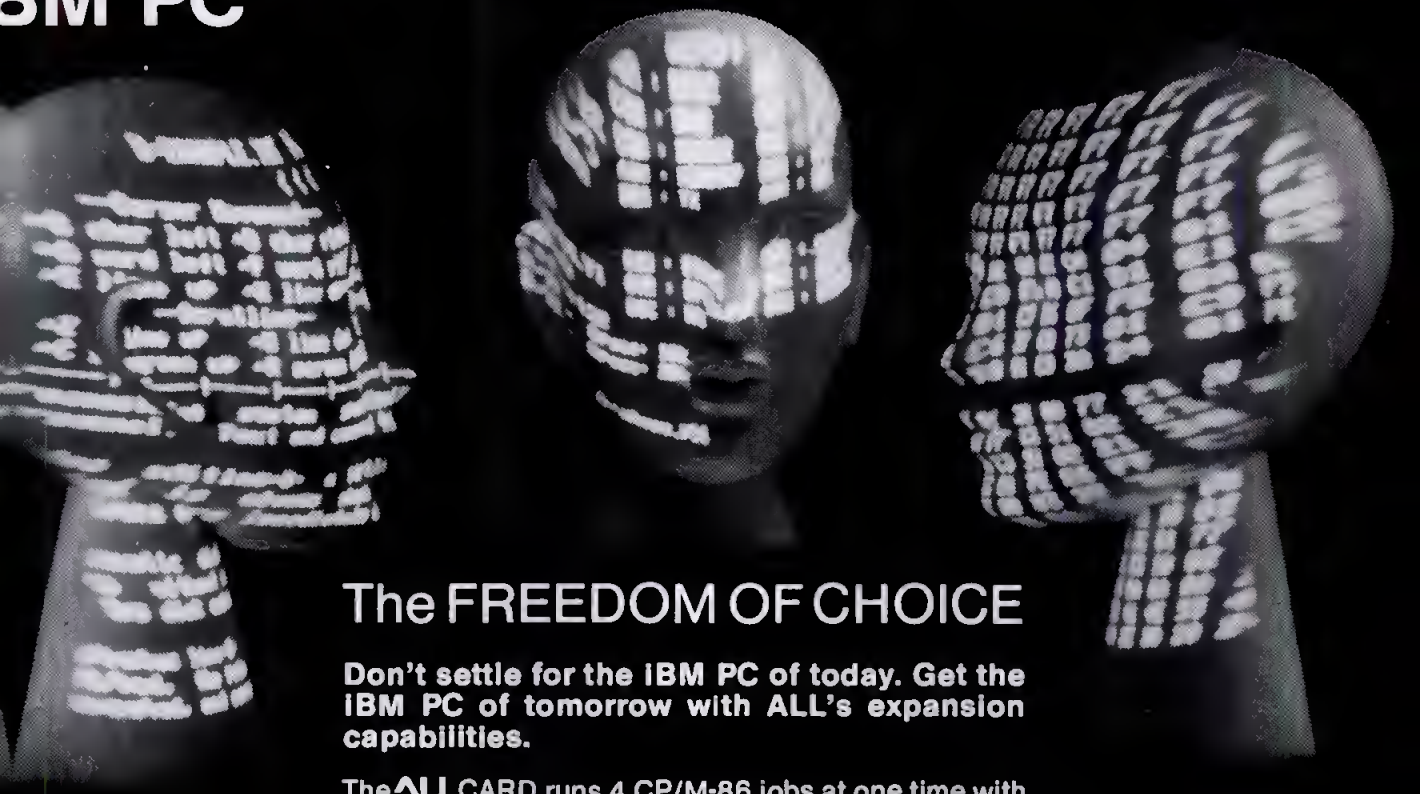

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- multi-tasking hardware
- hardware for future multi-user & expand to 4 MB memory
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written manual that competantly explains each of the fiva major functions of tha program: Entaring projection data, reviewing or changing projections, displaying projections with on-screan graphs, printing reports, and storing or retriaving information from a data disk. The package also includas a short demonstration program. For those who prefer to pull their numbers together with paper and pancil befora sitting down at the PC, it can generate printed worksheets. A beginner's road map lists tha logical sequence to follow in setting up a projection, together with a kay to sections of manuals.

Pluses and Minuses on Display

The copy-protected program is written in UCSD Pascal and includes its own p-Systam utilities for self-booting. Two copies of the program disk are provided. Thay will work with either display adapter installad in the PC, but require the color graphics adapter in order to draw graphs on tha screen. The Crop/Livestock Profit Projector features its own special charactar set, using an attractive sans serif typeface for haadings and sharply drawn column rules for charts and graphs. Unfortunataly, howevar, tha program coding does not take into consideration a system that might hava both the monochrome and tha color graphics card. On my machine I was unable to switch to the color monitor to see the graphs. I was also unable to print out screens or graphs from the program using tha PrtSc key command because of the nonstandard charactars.

YOU ARE allowed to enter as many as 24 different expense categories.

The program aasily staps through several layers of nested Help screens. If you're starting off with a new projection, the first screen takas you to the Enter Enterprisa screen. By "enterprise," the program is asking the nature of tha crop: corn, hogs, chickans, atc. The naxt question asks for a definition of one production unit, as in an ocre, heod, flock, dozen.

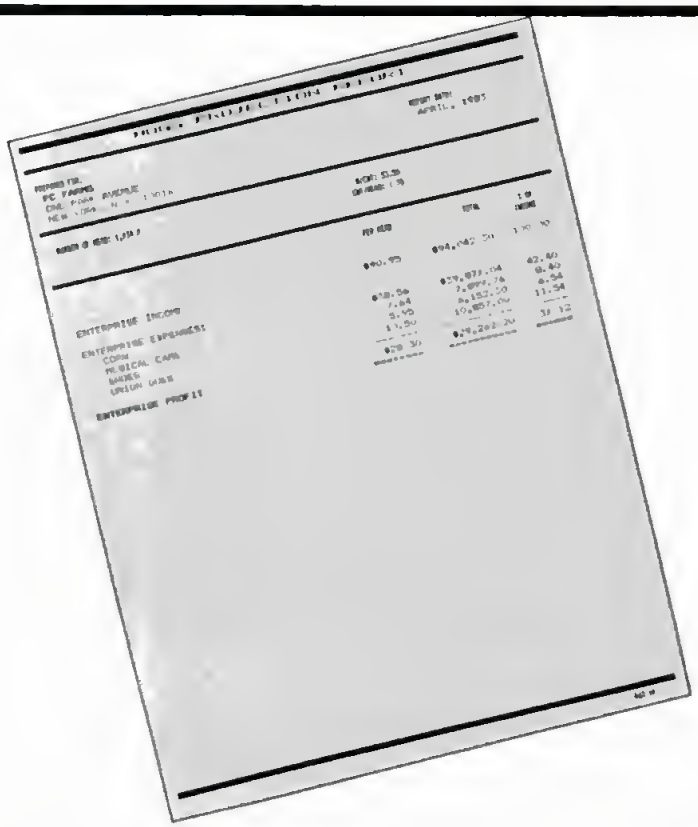

Figure 2: A copy of o short projection report for o mythicol Pork Avenue form. As mony os 24 different categories of expenses could be entered, presumobly with expenses other than shoes ond union dues.

Tha last major question asks how the product is pricad: by tha bushal, pound, ton, and tha lika.

Projecting the PC Hog Farm

Let's say your enterprisa is a hog farm. Your production unit is a haad and your product is sold at markat in hundradweight (CWT).

After you anter this information, the next screen presents a blank spreadshaet labeled at the top with the name of your agricultural enterprise. Tha first bit of information you must provida is the number of production units. In our example, "head" is already in placa on the screan, waiting your numerical antry. Let's say we have 1,034 head. Next, you ara askad the anticipated selling price per CWT, the unit of sale spacified. A recant prica for 100 pounds of pork on tha hoof was $53.50, so you enter this figure as your projected salling price. The program then asks tha axpected yiald par head. Lat's assuma you are producing hefty littla porkers that yield carcasses of 170 pounds or so; you would enter 1.7 CWT per haad. Almost immediataly, the spreadshaat is updatad to indicate the projectad gross proceeds from the sale of your livestock. In this case, 1,034 head of swine of 170 pounds aach at $53.50 per CWT are worth about $90.95 each at slaughter, or a total of about $94,042.30 before expanses.

Next comas the entry of projected expensas. You are allowad to entar as many as 24 diffarent axpensa categories, with the program automatically juggling as many as four screens worth of data. If you entar the cost per head for a particular expense, tha program will calculate the total cost for your faadlot. If you know only the total cost, you can enter just that and the spreadsheet will figure out the per-haad charga. And each expense immediataly alters the display of the net worth of your enterprisa. When all of the expensas hava been antared, you can go back and make corrections or changes, with the full benefit of the electronic spreadsheet's "what if" reactions.

Going to the Files

You can usa the data immediately for printing a report or to display a set of graphs on tha screen. Or, the data can be

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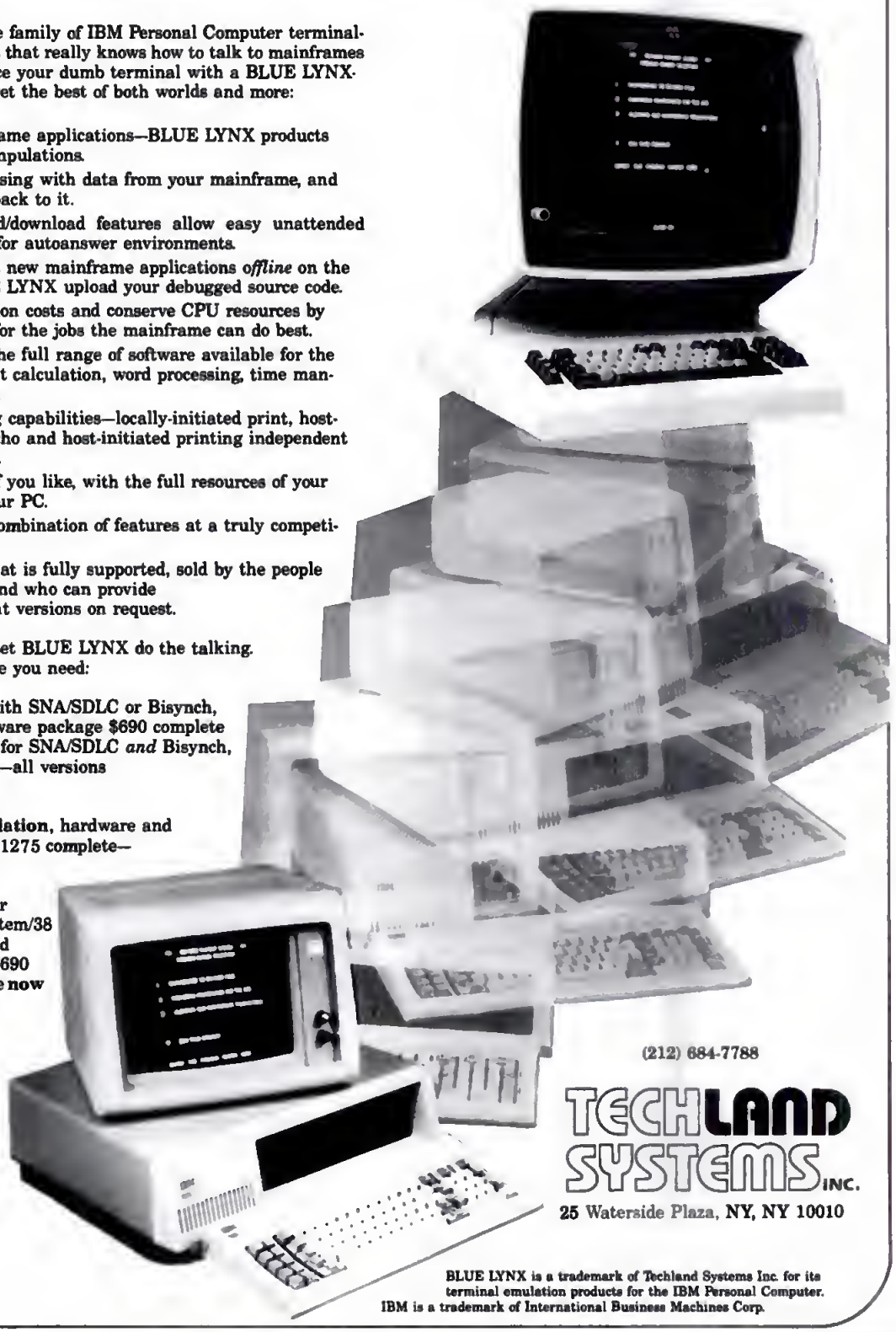

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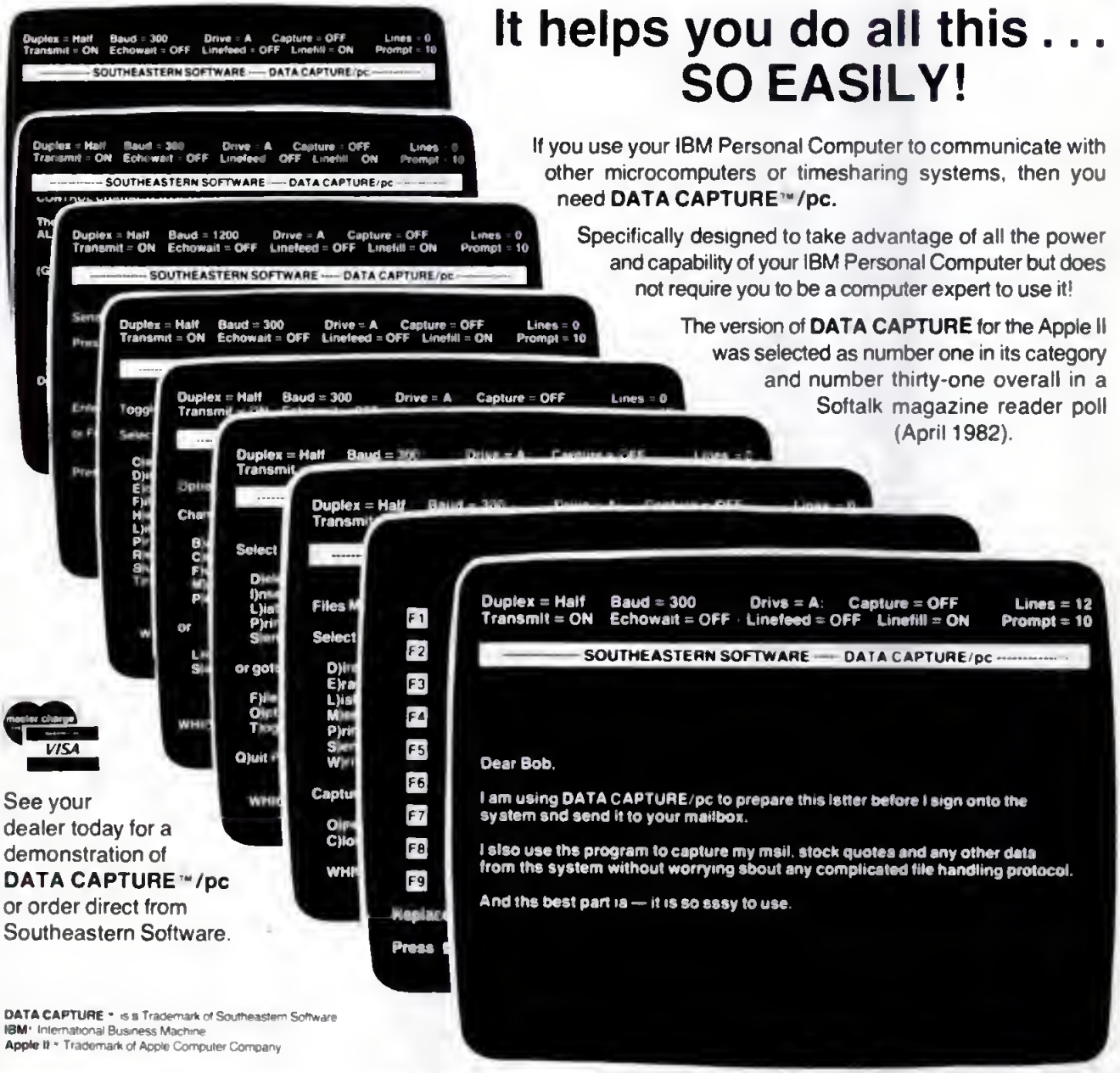

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stored on e formatted deta disk for future referenca end updating. The program produces e near menu-accessed directory of files on the data disk. The program only allows ten files on a double-sided disk. One shortcoming: it insists that data be manuelly retrieved from the disk before changes can be made or e greph printed. It would have been simpler for the user if one segment of the program could access another more reedily.

The Crop/Livestock Profit Projector will display two types of bar graphs on a monitor driven by tha color/grephics adepter: the projected expensas of an entarprise as a percentaga of expectad income, and en overell profit projection for eny end ell of the anterprises stored on the dete disk. The first chart fits in nicely with the "whet if" projections, although egain, you must exit the "Entar Projections Mode" before entering the graph section. The program does not produce copies of the graphs on a printar or plotter, e shortcoming made evan more obvious bacausa tha P-systam oparating system will not support PC-DOS screen dumps.

THE PROGRAM POSSESSED AN overabundance of beeps and buzzes as menus or screen prompts appeared.

Producing on Paper

The projection worksheets that can be printed from the program are near-duplicates of the on-screen prompts, and are explained in claar examples in the manual (Sea Figure 1). Tha projection report, a city boy's example of which is reproduced here as Figure 2, includes tha output of the on-screan spraedsheet together with the name of the agriculturel enterprise. Tha output could obviously be usad by the farmer in a presentation to e bank or production loen company, or by a consultant working on bahalf of e farmer.

The program performed well in testing, although there was one irregularly appearing bug thet caused unintended crosshatching to overwrita some of the bar graphs on the screen. Tha spreadsheet functions were quick end easy to learn, elthough as notad, the various segmants of tha program were a bit too isolated from aach other for an experienced or hurriad user. The program also possassad an ovarebundence of beeps end buzzes as menus or screen prompts eppeered. Wouldn't want to wake tha livestock too aarly, would you?

This product is the first of e series of programs for agricultural usa, according to the manufecturer. Already out on the market for the IBM PC are *Swine Management Series I*, *Corn/Soybeon Monogement Saries I*, and a sat of four volumas of templetes for VisiColc: *Feedlot Monogement*, *Business Monogement*, *Cow-Calf Monogement*, and *Crop Monagement*.

The *AgDisk Crop/Livestock Profit Projector* is a neat piace of work, end seems worthy of consideration for purchase down on the farm. */PC*

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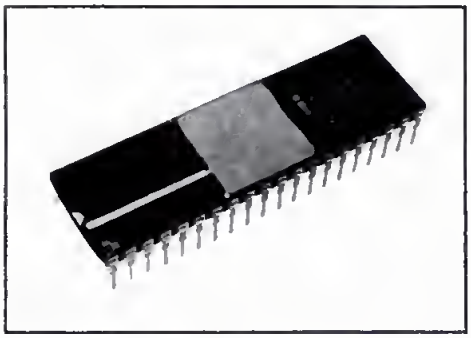

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- A programming style comparison: Digital Research PL/I-80™ vs. Microsoft BASIC.
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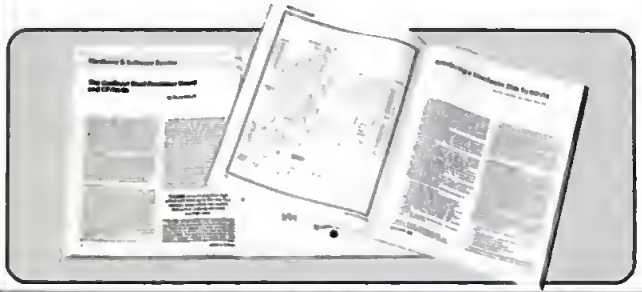

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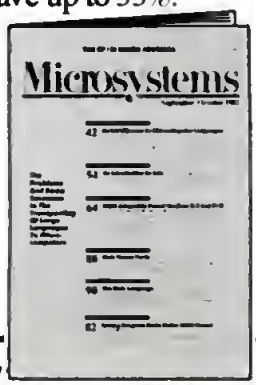

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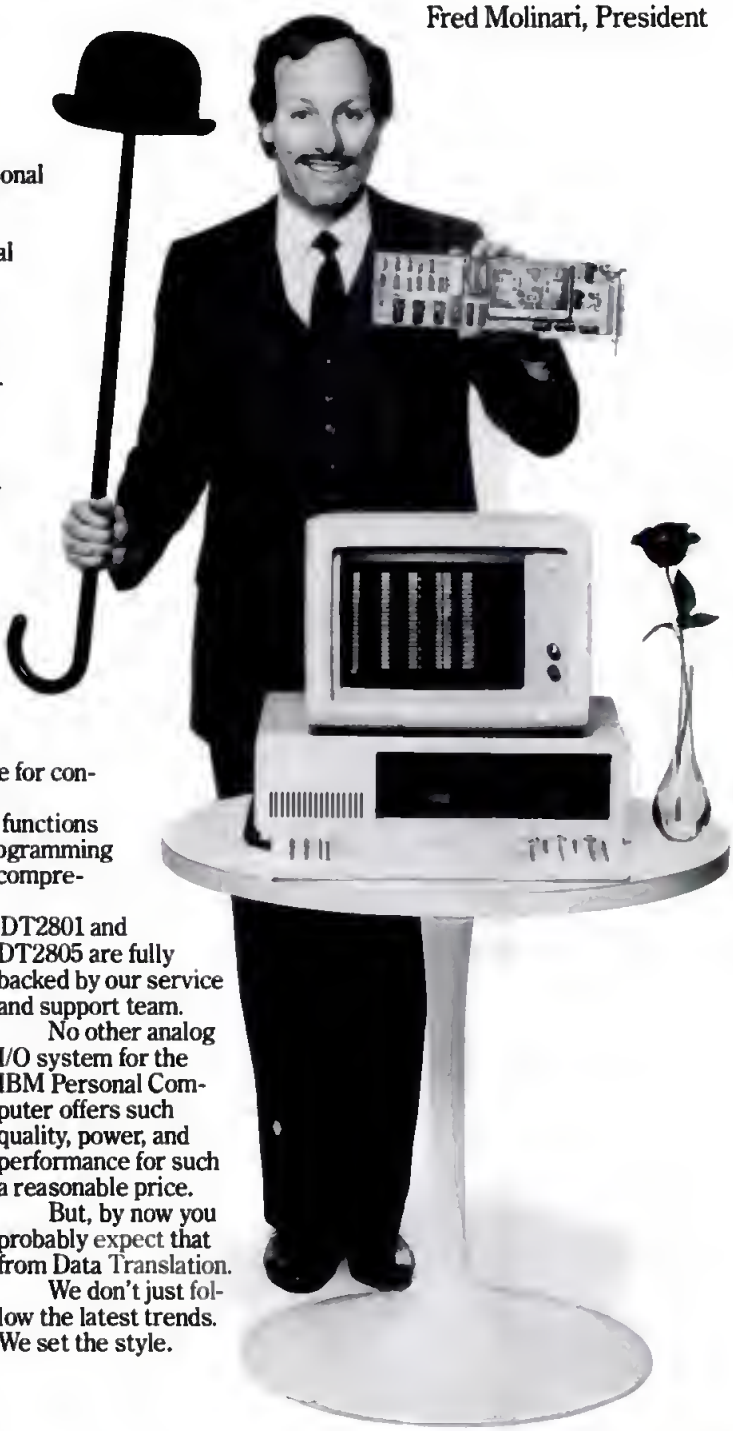

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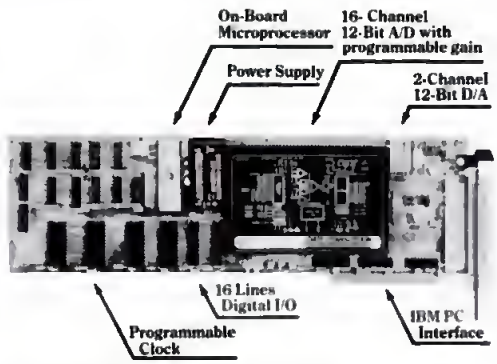

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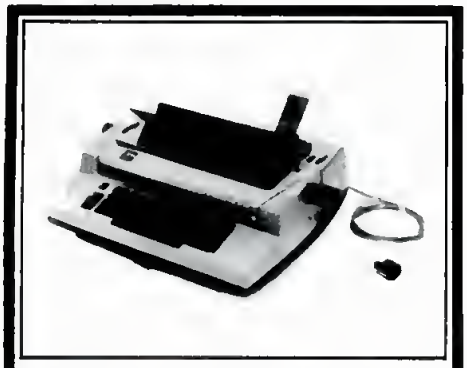

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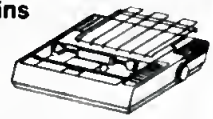

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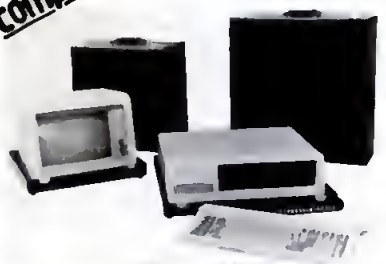

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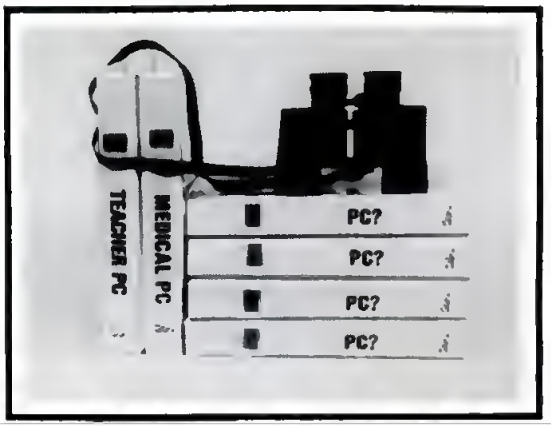

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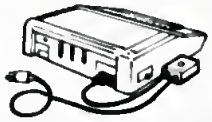

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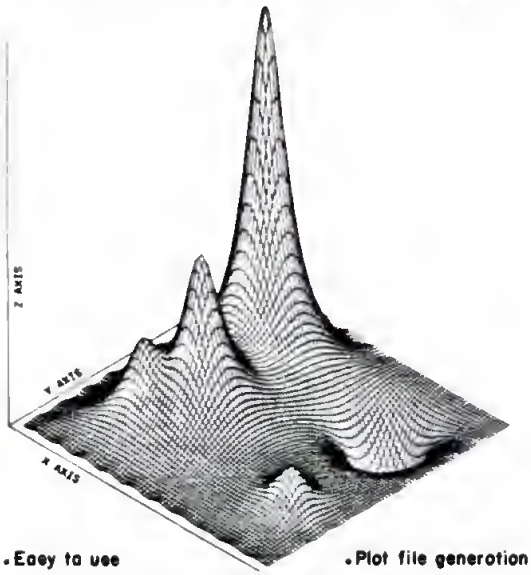

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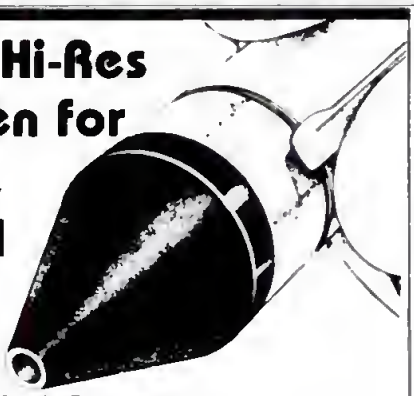

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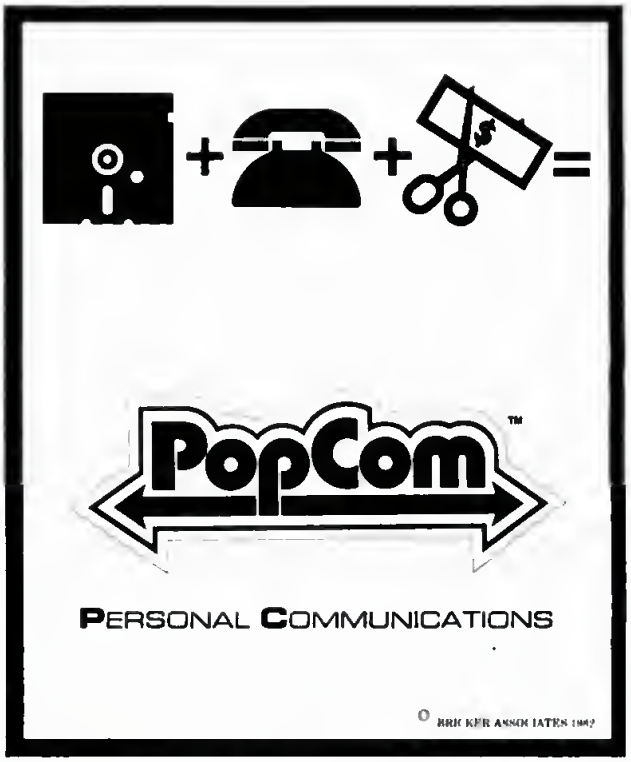

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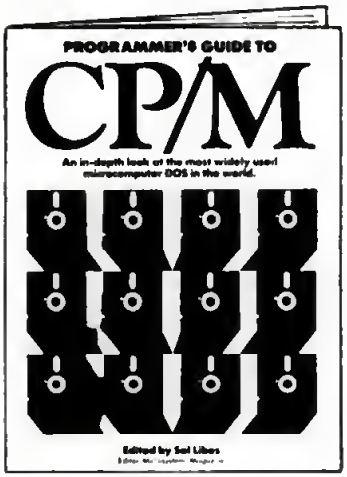

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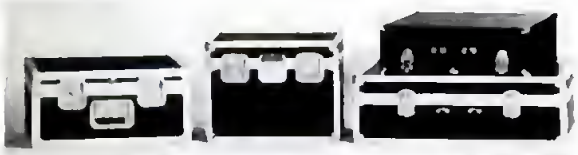

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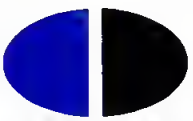

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CIRCLE 409 ON READER SERVICE CARD

As the evolution of undedicated word processors continues apace, at least one program derives its inspiration from the past—and its enhancements from the present.

The Simplicity of Qwerty

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CIRCLE 598 ON READER SERVICE CARD

You want a word processor for your PC. You don't want one that's too complex because you probably won't need all the features of an expensive, top-of-the-line program. You don't want to be unnecessarily burdened by extraneous procedures and commands. But neither do you want a bare-bones word processor. The solution? Only you can really decide, but among the middle-range word processors you should consider is *Qwerty*.

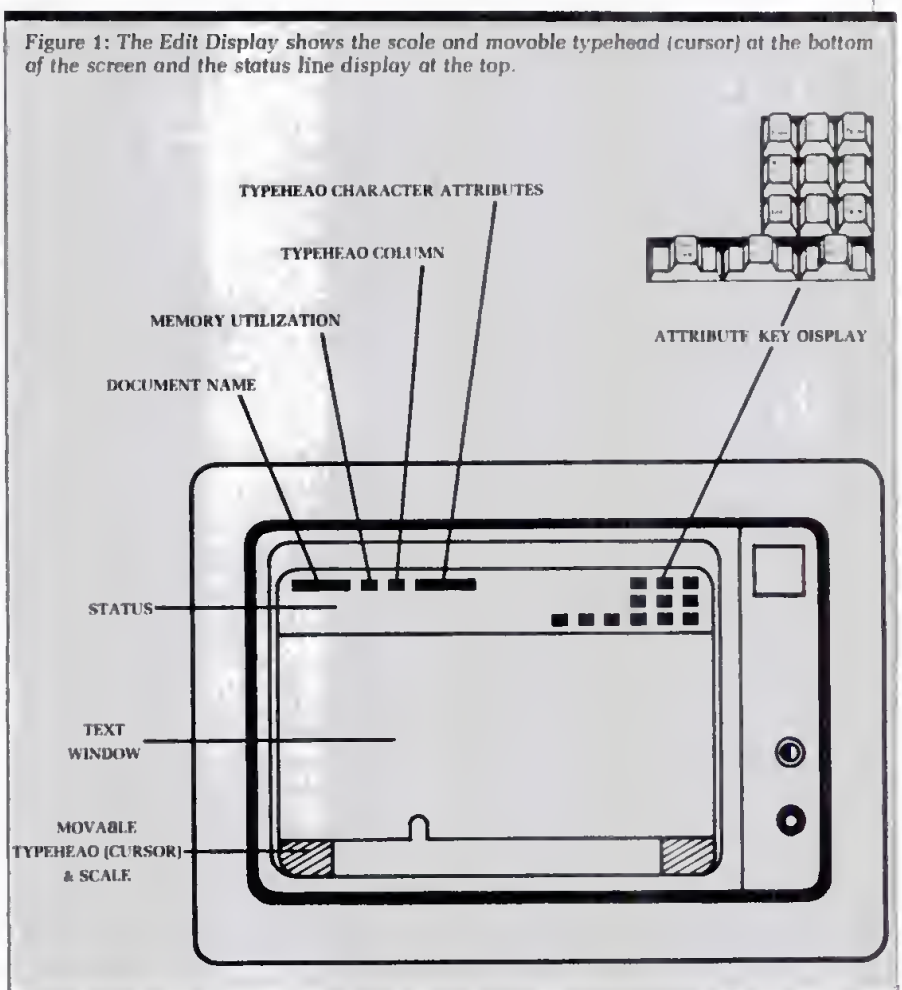
The system requirements for Qwerty are simple: 64K RAM and one disk drive. It loads into memory in its entirety, leaving room for the equivalent of ten pages of normal text. An additional 64K renders the program more convenient, but the extra memory is not necessary.

A word of caution, however. The version of *Qwerty* tested for this review would not run on the new PC-XT, nor on the Compaq or Columbia clones. This is probably because it uses the original PC's ROM coding. If you are considering Qwerty for a machine other than the PC, you should check for updates to the program.

Screen Display

The screen is well-laid out, with a 20 line by 79 character text display capacity; the text is centered on the screen. Although there is no horizontal scrolling, a line can be as wide as 150 characters. (In this case, the line of text above the cursor—or "typehead" as Qwerty calls it—wraps around and is entirely displayed. A one-line ruler at the bottom provides mar-

Figure 1: The Edit Display shows the scale and movable typehead (cursor) at the bottom of the screen and the status line display at the top.



gin end tab information. The top window is a three-line stetus displey. This shows the name of tha documant, the percantage of memory usad, and tha cursor locetion. It aiso givas a constant picture of tha numeric keyped "ettribute keys," which ere used to assign print ettributes such es underlining. (See Figure 1.)

When you start up *Qwerty*, a menu of five choices appeers. If you choose to chenge or print a document, you are asked for the nama of the document. if you choose to create a new document, you go directly to the edit displey; no name is required. Tha othar manu choices era to list the *Qwerty* files or to return to DOS. The Escape key returns you to the menu.

YOU NEVER have to reformat a document.

Qwerty, es you might guass from the name, is designed to emulete a typewriter. On the main edit display, the cursor rests et the bottom of the screen; it looks like the type-guide on a typawriter, except that as it moves across the screen, the new text appaars directly ebove it. As you type, the cursor moves to the right; at the end of the line, the "paper" moves up and the cursor moves back to the laft margin.

Function Keys

A very distinct faature of tha *Qwerty* systam is the use of the function keys (labeled F1 to F10 on the left of the keyboard). The Function Aid Card (see Figure 2) serves as e grephic reminder. You can attach it to the keyboard next to the keys.

Qwerty moves through the text by character, word, or line. Function keys F1 to F6 are for cursor movement by character (left and right); F3 and F4 are for movement by word; and F5 and F6 are for movement by line. To delete in any amount, you use the shift kay in conjunction with F2, F4, end F6.

You're in the middle of e job end you need help. No need to dig through your menual or strein your memory; simply shift to F1, F3, or F5. F1 will tell you what your establishad margins, tab stops, and peregreph indents are. F3 will display the syntax of commonly used format iines. F5 displays keys used in cut-and-paste operations.

You can scroll up or down one line, without moving the cursor, with F7 and F8. When you don't want to scroll up but need to peek at tha two lines below the cursor, a shifted F7 does just that.

BLOCKS CAN be marked, moved, and copied with two-stroke commands.

Search (forward and backward) is accomplished with e fourth pelr of function keys, F9 and F10. Search and replece uses shiftad F9 and F10. The saarch function can be usad to scroll quickly through the entire taxt with as faw as three keystrokes by "searching" for a character (iike the curly bracket symbol) that isn't in the

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CIRCLE 267 ON READER SERVICE CARD

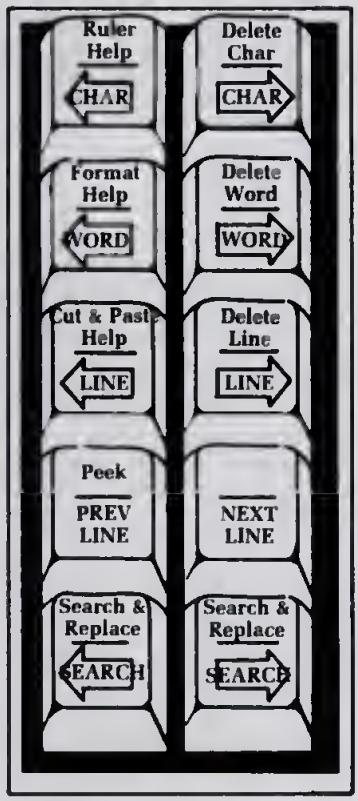
document. The Escape key can be used to stop the scroll wherever you wish.

The special uses of the function keys become intuitive very quickly; I found the function key reference cerd unnecessary after just a few hours of use.

File Handling

Blocks can be marked, moved, and copied with two-stroke commands. The block is stored in a temporery file on disk; it exists only until the next block move writes over it. You can execute moves within the existing text as well as to and from a disk file. This is not the most flexible method, but it is workable. One way to speed up this disk-dependent block move is to use an electronic disk program (which sets up e portion of RAM as an additional disk drive). Unfortunately, *Qwerty* would not function with the electronic disk that comes with the AFT board.

Figure 2: The Function Aid Card reminds the user of the particular uses of the function keys (F1 to F10).



Qwerty does not force you to name a new file before you have typed it. At the end of an edit, *Qwerty* asks you if you want to save the document to disk; you name it at that time. This gives you the choice of whether or not to name a file at ell, as well es the freedom to esteblish e logical naming sequence for e group of documents. Also, because you are not required to save to disk when you end en edit, you can print the document and, if eny adjustments remain to be mede, return to it with two keystrokes. *Qwerty* recognizes only files with the extension .DOC. For many, this will be no problem, but I found it inconvenient, since I rely quite e bit on the file name extension to sort directories.

THE ONE printing feature I missed was automatic headers and footers.

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CIRCLE 485 ON READER SERVICE CARD

No file utilities, such es reneme end copy, are included. This meens thet you must end, save to disk, end exit (four keystrokes). It's a bit inconvenient, and though the menuel offers explanetions of the DOS commands, new users will probably need help.

Another feature of *Qwerty* is the constant reformetting thet occurs whenever new text is inserted. You never heve to reformet e document.

Printing

When you purchese *Qwerty*, you specify two printers for which you went it configured. *Qwerty* specifically supports the IBM dot matrix, the NEC 3530/50, the Epson MX-80 end MX-100, the new Epson FX-80 and FX-100, and the Smith-Corona TP1. *Qwerty* worked perfectly with my Epson MX-80. The generel teletype category hendles other perellel end seriel printers. The teletype configuration does not ellow ell of *Qwerty*'s features to be implemented—proportionel specing, for instance, is lecking—but the program author promises thet the general printer configuration will provide e working interfece. The printers thet are supported are well-supported indeed; for example, the NEC printer configurations include commands to control two paper hoppers.

The format line (like the *WordStar* dot commands) consists of print-releted instructions. These are easy to remember (*2S for double spacing end *BN for begin numbering). A Help screen reminds you of the commands for turning justification on end off; changing pitch settings, line sizes, form, end pege size; and pegination, including intelligent pege breaks, continuous printing of linked documents, end optionel eutometic page numbering. The one printing feature I missed wes automatic heeders and footers, which ellow you to name, es well as number, eech page.

The numeric keyped controls print ettributes. *Qwerty* allows you to assign print ettributes both during end after text entry. To underline, simply hit the underline key and the line key and you've got on-screen underlining. Boldfece is reflected on the screen; double underlining, sub- and super-script, end overstrike are indiceted by inverse characters. Ruler lines control left and right mergins, tabs, and paragraph indentation. Not only can these be set in eny place in the document, but, when you set them, the text is autometically reformatted. If you make a margin change, you'll see it immediately. Indented paragraphs and henging paregrephs are eesily set up. Tabs you set are

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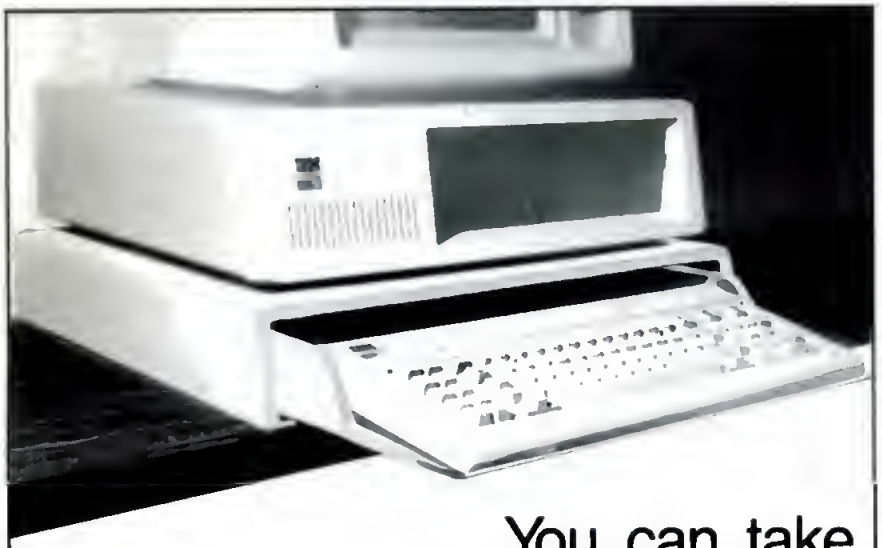

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real tabs (not inserted speces). This eliminetes the problem of text being pulled to the left through e teb when text is deleted.

You justify text with a format line. *Qwerty* provides semi-automatic hyphenation: You can protect spaces so that words will stay together and suggest syllable breaks for long words.

> ***TO UNDERLINE, simply hit the underline key and the line key and you've got on-screen underlining.***

Best of all, these print features are integrated into *Qwerty*'s editing process.

Easy to Use, Easy to Try

Even first-time users will have no difficulty installing DOS end specifying the appropriate printer configuration. The 90-page *Qwerty* manuel is e model of appropriete documentetion. It is neither a telephone book-sized bible of technical reference nor a long tutoriel calling for jigsaw-puzzle patience. The beginner can easily menege the 15 short lessons. Those with experience can use the index to find answers to specific questions, the glossary to find definitions of *Qwerty* terms, end the eppendices to find quick explanetions of the function keys, shifted function keys, and printing. Users cen call up Help screens in the status display aree et the top of the screen with three shifted function keys. These provide thumbnail reference to the ruler line, the format line, and line and block moves.

If you want to try it before you buy it, *Qwerty* has a 60-day no-risk trial plen that gives you a chance to try it out for a $20 handling fee. *Qwerty* is also protected; e $15 backup can be ordered from the publishers after they receive the registration.

Final Word—or Two

I was a little skeptical when I first saw the brief menu display. But in the time I've used *Qwerty* I've found the menu to be very efficient, end I liked the use of the seme keys for cursor movement end text deletion. But I was most impressed by the eese with which formatting features were integrated into the editing process. It's greet to hit three keys and have a line of underlined boldface text eppear on the screen.

Any administrative word processing operetion would appreciate *Qwerty*. Because of its excellent manual end logical integration of printing, file-handling, end editing, this package is a good choice for personal or small-office use. Its foremost adventage is that it is easy to leern end use. This ease of use results from the well-thought out choice of feetures. For, while other peckeges have many more feetures, leading to ineviteble confusion, *Qwerty* handles large jobs simply and well. In fact, I used *Qwerty* to write this article.

I heve used half-a-dozen word processing packages, end I found thet I was using 90 percent of *Qwerty*'s functions after just a couple hours of use. In contrast, I only use 20 to 40 percent of an overly-endowed word processor's functions. If you don't need the more esoteric features or don't heve one of the fully-supported printers, you would do well to give *Qwerty* a trial. */PC*

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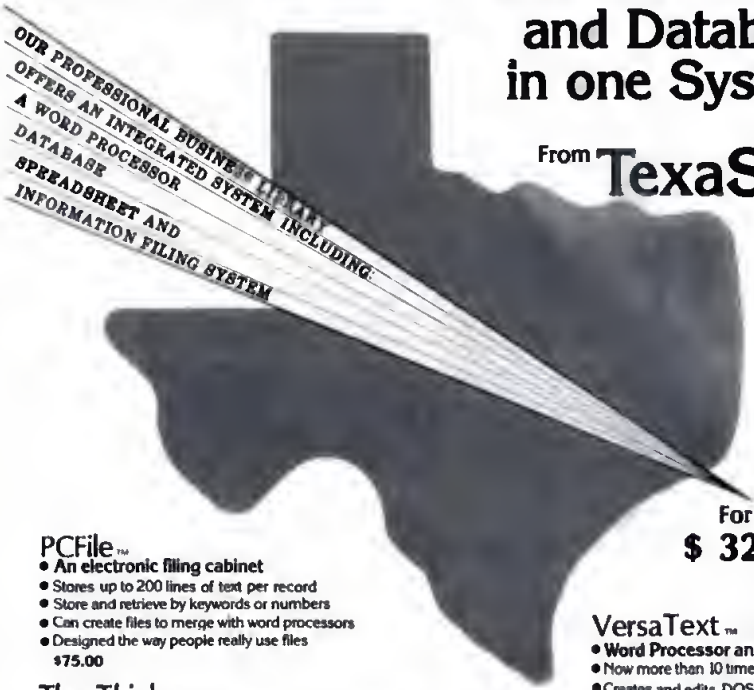

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The Texas company that produced the highly successful PC Introductory Set, hopes to capture the attention of computer game fans with PC Arcade.

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CIRCLE 578 ON READER SERVICE CARD

Back in 1982, a Texas pizza franchiser namad Mika Yaw took a ragtag group of programmers and marketing specialists and produced one of the PC's biggest software success stories—a three-disk packaga of beginner's programs called the FriendlyWore PC Introductory Set. The first month it hit the computer stores, FriendlyWore albowed its way onto the best seller list.

Now, FriendlySoft hopes to eclipse its earlier success with a new all-game package called FriendlyWore PC Arcode. The company claims that the initial two production runs were snapped up even before tha first copy was shipped.

A Stroke of Genius

There were several reasons why FrlendlySoft's first affort—a grab bag of software from a fledgling organization—was so successful. For one thing, the name was a stroka of genius. Novice PC users were tearing out their hair over some of tha poorly documanted, slapdash software that had been rushed onto the shelves soon after the PC was introduced. FriendlyWore came in a tidy padded standard (IBM) size bindar and was typeset on glossy paper. Instructions were clear, concise, well-written, and even amusing. Thay were accompanied by interesting and understandable sections on such topics as the devalopment and operation of computers, differences among various computar languages, and the intricacies of file structure. They even stepped the user line-by-line through one of the BASIC programs in tha package.

"But seriously, folks . . ."

Tha Introductory Set broke the ice for new users by opening with a screen informing them that they would hava to answer two questions before proceeding: "What is tha total square footage of Idaho?" and "How many nickels are there in $1,387,865?" Then, after a few seconds, the screen impatiently flashed the message "WAITING WAITING WAITING." It immediately apologized for the joke and jumped into an attractive menu. Other hlerarchical menus branched off from the main one. Each allowad the user to move easily from one part of the disk to another by using single keystrokes. The screens were well designed, containing a good deal of information on what alsa was available and on how to access other manus—all ln all, a top-notch job.

The first disk provlded a fairly comprehensive introductlon to computars—one of the best available at the time. It also offered a slate of games and a hearing test. The second disk contained other games, and included a biorhythm program and a drawing utiiity that the developers had used themselves to create ASCII character images for the FriendlyWore package. Thare ware several homa and business programs on the third disk, one of which—the checkbook register—recaived rave reviews.

Best of all, the programs ran equally well on both color and monochrome systems, and sold for only $49.95. Raviewars chuckled that the checkbook balancer by itself was worth more than that, and troweled on praise so heavily you'd think these fellows from Taxas ware salling dollar

bills for a quarter.

PC owners flocked to this peckage because it wes indeed e good velue, as well as something even novices could operate. It didn't hurt thet there reelly wasn't any competition. Dealers liked the software because they could use it to demonstrate the PC. As the FriendlySoft dealer's brochure noted, about the only thing prospective purchasers could do with IBM's own demo wes "dodge the donkey—not real exciting stuff." Also dealers could easlly afford to give the set awey as an Incentive to buy a PC.

Less Is More

FriendlySoft's second peckage is devoted exclusively to arcede-type gemes. It also sells for $49.95, but contains fer fewer programs. Even so, FriendlySoft's PC Arcode will probably do very well.

First, there is a good chance that most of the purchasers of the first set are satisfied customers who will come beck for more. The price is still fairly low; about the only software you can find these days for under $50 are one-to-e-disk games, modest utilities such as cross referencers, end such atypicel promotions as Bruce & James WordVision. As with the Introductory Set, the FriendlyWore PC Arcode menus are a pleasure to breeze through. And it will work well on color or monochrome systems.

Poor Facsimiles

The real strength of PC Arcode, however, is thet it conteins versions of some of todey's most popular home and arcade games, adapted for the PC. For 50 bucks, you get primitive versions of Lunor Lander, Breokout, Donkey Kong, Centipede, Defender, Berserk, and Frogger, plus still enother edition of Pocmon. You'll also receive e shoot-em-up game similar to Attock, end e horse racing game called PC Derby.

The individuel programs have been translated to the PC with varying degrees of success. Donkey Kong, for instance, allows three levels of play and offers most of the feetures of the coin-operated model. But the designers were limited to ASCII characters for all their imeges. As a result, Kong resembles a second-grader's stick-figure conception of a robot. Your on-screen ledder-climber is the ASCII smiling face, as is the girl you're trying to rescue. The hammer you use to beet off the tumbling coconuts is e truncated arrow. The other gemes are similarly constructed; the animels dashing for the wire in the horse rece resemble gellopIng cocker spaniels. Still, considering the fact that these imeges were mede out of rectangular blocks, it's feirly amazing thet they look like anything. Unfortunately, you don't do anything with the horse rece; you just watch. The computer pleys the game; you're supposed to bet on the results. To quote the manual:

". . . any suggestions thet the geme is non-participetory goes right out the window about midwey through the first race. Sit 5 or 6 otherwise normel adults down in front of PC Derby, let them each pick a horse, end start e race. Within 20 or 30 seconds they won't recognize eech other. Some will be shouting 'C'mon Deuce!', some will be pounding the teble, end some will literally be jumping up and down. Add a smell bet to the action and you'd swear you were standing on the finish line at Churchill Downs." Swear that, end you'll soon be standing in the thorezine line et the laughing ecademy.

THE ANIMALS dashing for the wire in the horse race resemble galloping cocker spaniels.

White On White

PC Arcode does contain some nice touches. The programs are written in assembly languege, which mekes them fast end flexible. The peddle in Brick Breoker, e geme written in PC Porrot creetor Tony Chumak, slides back and forth so smoothly you'll never put up with balky BASIC graphics egain. The sound effects for this progrem, by the way, are excellent. The noises produced by most of the other nine games aren't.

The programs use color sparingly, and in some cases, not at ell. On IBM's high-quality color monitor, Bug Bloster weaves a white centipede-like object ecross a white playing field, dodging white obstacles and white arrows thet your white shooter shoots. Color would definitely have helped here. The euthors admit this subconsciously; the prose in the manual warns thet the "slithering crawlIng bugs" are "disgusting" and "look bad." True enough. The manual boasts of FriendlySoft's reputetion as the text mode experts. They're all right, but let's not get carried awey.

Mustard On Your Hub Ring

From cover to cover, the manual is similarly effusive and cute—and unpolished. It speaks of "die hards" and "It's femiliar ball" and "it's own set of obstacles" and rabbits "laying ebout helfwey across Americe's roads" end a river that is "no piece of cake either" and the amount of rocket fuel left "et touch down" and "learing how to" fly successfully. No, this was not trensleted from Jepanese. Worse, the manual writers misspelled the name of the package at one point es "PC ARACDE," end even misspelled part of the name of the company on the title page as "THE FREINDLY FAMILY . . ." This doesn't detract from the performance of the programs themselves, but you'd think they'd at least get their own name right on the first page.

The disk uses Its own operating system. It boots eutometically, and won't let you make copies. The company obviously felt thet the first set of disks, which were not protected, was becoming a sort of unintended Freeware. One edvantage Is that you don't heve to worry ebout putting DOS or BASICA on the disk. If you do put anything else on it, such as a greasy thumbprint, a permanent magnet, or "a staple through the media or mustard on the hub ring," FriendlySoft will replace it within 48 hours of receipt of the original.

In eddition, FriendlySoft offers a 24-hour hotline (your dime, not theirs) so that confused users can get help. In fact, if you believe the literature, after-hours calls are forwarded to the home of a programmer or a staff member. It is true that programmers keep odd hours, but do you really want to weke up someone in Texas at 3:30 in the morning because your gorille won't jump?

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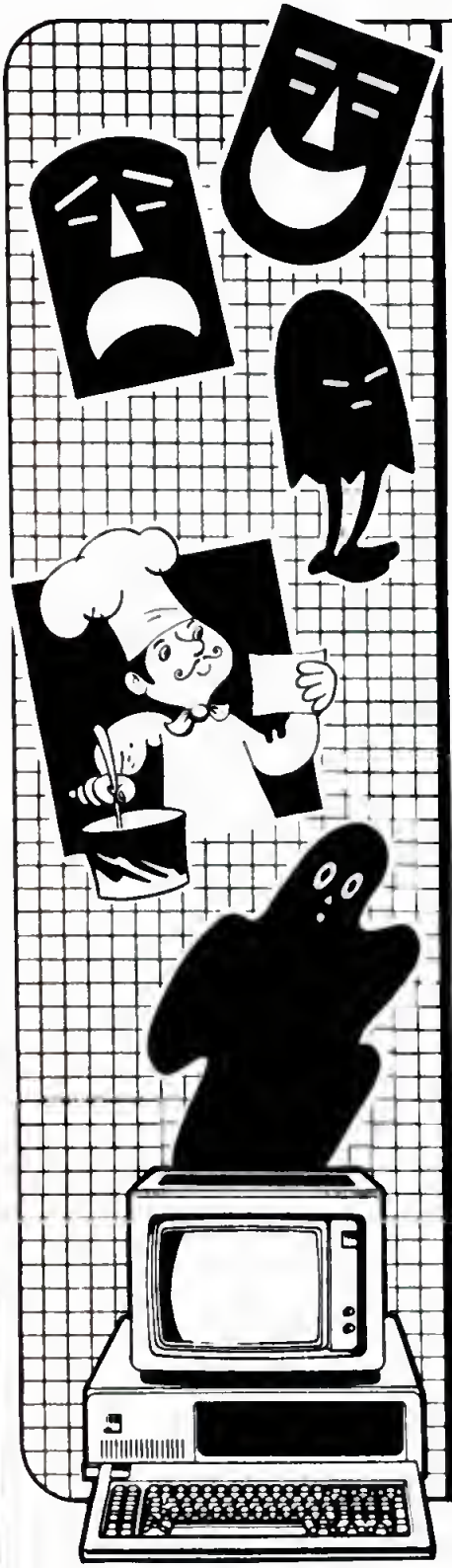

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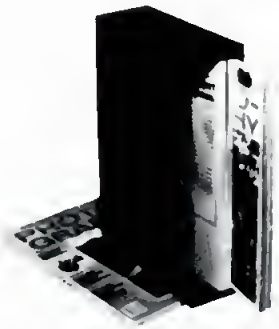

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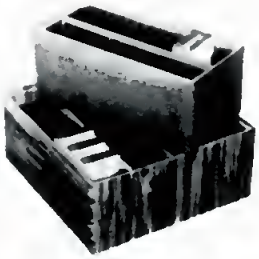

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priate setup questions. If you don't have a color graphics adapter, it will skip this setup entirely. If you have a game adapter card, the program will ask if you have a joystick attached and will calibrate it if you do. All of the games except *Eogle Lander* can handle a joystick, and you can use additional *diogonol* cursor control keys (7,9,1, and 3) in some of them.

When the Cat's Away

The program also uses several function keys. F10 lets you pause at any point, exit prematurely if you'd like, and return to the main menu. The other two function keys allow workers to play in their offices surreptitiously. F9 toggles the sound on and off; and F1 activates a feature sure to become popular. In the middle of any game, if you hit that key, the game disappears in a flash and is replaced by an innocent-looking bar chart. When the coast is clear, tap F1 again and you're back at the frog pond or deep in space zapping everything in sight. The manual calls this the "boss is coming key." And people wonder why American workers are not as productive as workers elsewhere.

Practice Makes Perfect

A few years back, Pong was state of the art, and everyone marveled at how you could actually *ploy a gome* on a little computer. This package is the Pong of tomorrow. FriendlySoft did an excellent marketing job, but only a serviceable programming one. Still, its graphics do work on the monochrome screen and the disk is very easy to operate. PC users and dealers will probably flock to it and spend joyous hours with it. But a few years down the road, we'll look at this in disbelief: "They called that graphics? They played primitive games like that for hours on end? IBM sold monochrome monitors?"

PC Arcade is far from perfect. But it is friendly as they come, and a decent value. If you have a monochrome screen only and if you think of a dollar bill as four chances to chomp Ms. Pacman, you'll love it. But if you're waiting for rapid, seamless animation in dozens of colors, keep waiting. The 24-hour hotline and the lifetime guarantee are nice touches, although a copyable disk would have been preferable. The price is not too outrageous. FriendlySoft's motto is "Great software. Great prices. Great support." Well, two out of three isn't bad. */PC*

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Listen. We're going to let you in on an industry secret: It's not hard to make a good spelling checker.

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The hardest part of a spelling checker to make is the dictionary. It's hard to pick the right words—and spell every one of them perfectly. That's why some popular spelling checkers don't even contain real dictionaries. They use formulas called "hash tables." Which make a hash out of your spelling some of the time.

Other spelling checkers "borrow" their words from printed dictionaries —or copy them from old word lists. Or give a programmer who can't spell "programmer" a chance to write his first dictionary. And as though all this wasn't bad enough, a lot of these companies want to charge you $100, or $200 or even $300!

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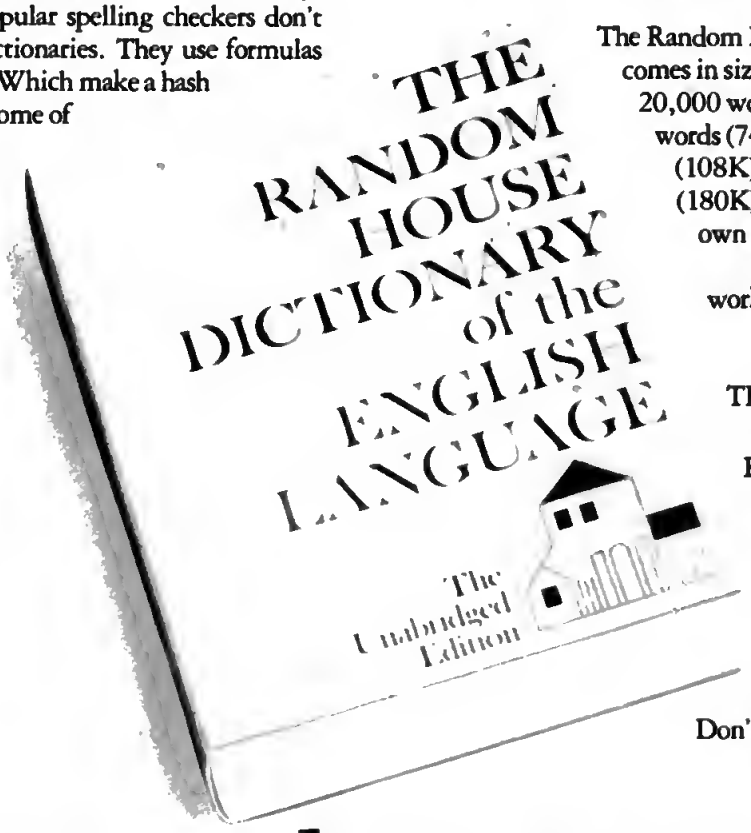

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Understanding Warranties

Following the purchase of an IBM PC for our law office, I began to sift through the pile of instructions, documentetion, spec sheets, and license egreements thet IBM so thoughtfully provided. Eventuelly, beneeth e mound of cardboard and shrink wrep, I found e small maroon notebook with the words "Guide to Operetions" hot-stamped in white letters on the spine. Eager to learn more, I opened the notebook. On the first pege wes an ominous-looking document entitled "LIMITED WARRANTY."

Unimpressed, I did what most others have done before me. I quickly turned the page and proceeded to reed up on more cheerful topics such es DOS, printer configuretion, and disk drives. Ageinst ell odds, I hed my PC up and running within an hour.

I imagine thet first experiences with the IBM PC end its documentetion are, like mine, common occurrences. Usuelly, if one simply follows directions, one's new electronic tool will live up to expectations. However, whet heppens when something goes wrong? As more consumers buy personel computers, there will inevitebly be an increasing number who were sold the wrong product, feulty products, or perfectly good products that aren't competible with eech other. Whet rights do these people have?

Limited Warranties

Computers are subject to many of the same warrenty end consumer protection lews that cover more familiar items such es televisions and toasters. If you are unheppy with some part of a computer purchase, the first thing you should do is give the seller an opportunity to remedy the problem.

IBM's Limited Warrenty is typical of warranties provided by computer manufecturers. Some compenies warrent their products for e year or more (rather then IBM's 90 deys), but the basic terms of the documents are similer. The IBM warranty requires that an unheppy consumer bring his sick PC to IBM or an IBM-euthorized deeler. IBM promises to repair or replace the product if it is found not to be in good working order for e period of 90 deys following the purchase. By making this promise, IBM is offering whet is known as e limited "express warranty."

The Magnuson-Moss Act (15 USC 2301), e federal consumer protection law, applies to personal computers (and other consumer items) even when they are used for business purposes. Certain express consumer warranties thet don't meet the "Full Warranty" requirements of Magnuson-Moss are automatically termed "Limited Warranties." The Act end its Federel Trade Commission (FTC) reguletions are complex; if you have suffered substantial demeges because of feulty computer hardware end/or software, consult e knowledgeable lewyer.

Usually e cese of herdwere fellure is relatively easy to remedy. But if the problem is more involved then hardware failure, you may have difficulty obtaining satisfection from your deeler for e number of reasons. Suppose, for exemple, you bought a mailing list progrem with the

Illustration: Don Day

computer. After investing months inputting a mailing list, you decide to switch over to hard disk. At that point you find out that your progrem will not run on e hard disk. If something like this heppens, here ere some things to consider.

Invisible Warranties

Were there any warrenties other then those expressly provided in the limited warrenty? This isn't es eesy to enswer es it may seem. Werranties come in different guises—many of which aren't even in writing. If you run into a situetion where you are unhappy with your purchase, you should ask yourself, "How did I make the decision to buy this combinetion of herdware and software?" If the enswer is thet you did the research end decided on your own, you may have nowhere to turn unless the system is simply not "merchantable." But if you described your needs and the dealer mede e recommendetion, you mey heve received much more then a useful tip.

You mey heve received a werranty known as the "Uniform Commerciel Code (UCC) warrenty of fitness for e perticular purpose." This is en implied werranty that arises when a seller recommends a product to suit the needs of e buyer. If the product does not justify the seller's recommendation, the buyer has certein legal rights. These include the option to recover damages resulting from heving relied on the recommendation, as well es the difference between the cost of an adequate system end the one that wes recommended.

IF THE PRODUCT does not justify the seller's recommendation, the buyer has certain legal rights.

Naturally, recovering from e recalcitrent seller will not necessarily be everyone's idee of a good time. You mey heve to go to court (or Smell Claims Court). The UCC, incidentally, unlike the federel Megnuson-Moss Act, is a series of individually edopted stete lews. These lews very somewhat from stete to stete.

The seller mey argue thet the warranty (if there is one) wes discleimed. If you read the fine print on the "limited warrenty," rather then quickly turning the page, as I did, you will see IBM's ettempt to disclaim the implied werrenty of fitness for e particuler purpose. A chepter on "Legal Care for Your Software" tells software publishers how to disclaim werrenties. The "implied warrenty of fitness" comes into play if the seller recommends e specific hardwere/software combinetion for e customer's perticuler needs. In such cases, the consumer is said to "rely" on the seller's expertise.

If, for exemple, you explein to e salesperson thet you need e computer end progrem to help you celculate construction costs, an implied werrenty is creeted if the selesperson seys something to the effect of "This package will do the job for you."

Whether e discleimer of the implied warranty of fitness will be effective in shielding the seller depends on the fects of eech case end the sympethies of the court. Frequently, these disclaimers ere found to be invelid. If the disclaimer was not eesily reedable at the time of the sale, but was packed eway in the sealed carton, it will often be voided by e court. This is why IBM end other savvy vendors shrink-wrep the disclaimer (facing out) to the slipcover of its software. There are several other possible UCC warrenties. One is known es the "implied warrenty of merchantebility." Agein, this is not e written warranty. It comes with every sale of goods and is velid unless it is properly discleimed. The warrenty basicelly provides that en item (such es e computer) will perform the wey it should end the wey that other similer items perform.

Express Warranties

Other werrenties fell into the cetegory of "express werranties." These needn't necessarily be in writing. An unwritten express werranty mey be creeted if the computer dealer gives you a demonstration of e computer and you purchese one besed on the demo. It is not uncommon, for example, for e salesperson to demonstrete a progrem on a mechine thet has more memory then the one contempleted by the buyer. If this fect is not disclosed to the buyer who subsequently purcheses the system, he mey be entitled to the remedies discussed ebove if the system does not perform es demonstrated.

An example of an express written warranty occurs when a purchase is made on the basis of published specifications. If, for instance, the specificetions state that the computer comes with 320K drives, but it is ectuelly equipped with 160K drives, an express werranty will have been breeched. You will then be entitled to tha larger cepecity drives and/or money dameges.

CONSUMERS should proceed on the assumption that software is capable of being warranteed.

Pondering the Intangibles

In meny respects, computer warranties are like other product warranties, but there are some unsettled (and unsettling) questions. One of these is, "To what extent is *software* governed by warranties?" Meny lewyers argue that software is an "intangible" and not e "good." Generelly, warranties don't epply to intangibles. Others counter by claiming that software, especielly microcomputer programs, are products or goods. Certeinly IBM has done its best to make its software look substantiel end as much like a "good" as possible. IBM even refers to its programs as "products." Finally, even if software is not a "good" when sold by itself, when sold in conjunction with a computer, the overall peckage of hardware and software is a "good."

It will be some time before case law develops sufficiently to help lawyers accuretely predict when a disclaimer will serve its purpose and when a court will throw it out. In the meantime, consumers should proceed on the assumption that software is capable of being warranteed. Taking this position can't hurt and you stand e good chence of prevailing, especielly if the software and hardware were bought from the same seller. */PC*

Paul Remer and Daniel Remer are partners in the Mountain View, California law firm of Remer, Remer, and Dunaway.

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BUSINESS/DAVID AHL

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Understanding Computer Crime

Your business computer, be it an IBM PC, System 34 or 4300, is very much like e cash register—e tool to telly up seles end store the proceeds. But elso like e cesh reglster, lt can be robbed by crooks, end lt is subject to disgruntled employees dlppIng into the till. But unlike e cesb register, e computer is e powerful tool for commltting much more serious crimes.

Technological Robin Hoods?

Computer security experts like Donn Perker of SRI have been waving the red flag ebout computer crime for years. Perker calls the increase of computer crime "epidemic." Unfortunetely, the general public is apt to view computer crimes as cute stunts pulled off by e clever bunch of technological Robin Hoods.

The medie publicizes such crimes as "malicious mischief." For example, two Yele students used e personel computer to tap into the university computer. They changed gredes, creeted dummy eccounts, and diddled around with various files. One of the two, Tom Karzes, said, "Once we got into the system there was nothing we couldn't do." Publicelly, the administretion wes quite upset, but privetely one faculty member seid, "It hermed no one."

More recently, two Chicago-area teenegers used e home computer to invede the deta processing system et DePeul Unlversity, then threatened to shut down the system unless lt hended over e progrem they wented. Although DePeul called in the pollce, lnvestigator Dougles Ellis said, "They dld lt because everyone seid lt couldn't be done."

Going for the Jugular

Suppose these youthful "pranksters" hed decided to tap into one of the four mejor electronic funds transfer (EFT) systems—FEDWIRE, CHIPS, BANKWIRE or SWIFT. The four move ebout $400 billion a day domestlcelly end about $600 billion internetionally. William Moroney, president of the EFT Associetion, meinteins thet the EFT systems are "quite secure" but elso admlts thet they heve "windows of vulnerebility that shouldn't exist, such es sloppy internal prectices end technical sbortcuts."

Moroney goes on to observe, "When you're telking ebout moving billions of dollars around the country, and making money depends on your ebility to move it in minutes insteed of hours, you're talking ebout millions of dollars that can be earned simply by speed. Thet speed can be slowed down by too much security."

Anyone who wents to meke e system secure must weigh the cost of security egainst the risk of exposure. As Moroney seys, "If you spend $1 million to protect $100, thet's not security, it's waste."

So whet can you do to protect your computer? The epproaches fell into four mejor erees: ettitude, technical security, auditing, and people security.

Attitude

Tbe ettitude held by the mejority of buslnessmen todey is that lt "can't happen here." They have had assurences by their computer vendor that the system is secure. They "know" thet their employees are heppy, well-peid, end bonest. Although tbe varlous equel opportunity acts prevent employers from esking prospective employees ebout criminel records or exchenging dete about employees, most businessmen ere unwilling to believe that they could possibly hire e criminal.

Dete processing manegers frequently feel secure because of the safeguards and security procedures that have been instituted. However, this is what Donn Parker calls "the Maginot Line syndrome." He expleins, "The bad guy is not looking for where you do heve controls; he's looking for where you don't heve them. He's going to end-run your system every time." Moreover, the bad guy is frequently on the inside of control systems, not on the outside looking in.

An ettitude commonly sbared by progremmers end people in the deta processing department is, "Hessle me not with these security procedures." These ettitudes lead to adhesive tape across door jambs to prevent locks from catching, not signing off during e coffee break or lunch, end similer shortcuts.

As long es ettitudes of complecency end hessle-me-not continue to preveil, a company might es well leeve the cash drewer on the register wide open.

Technical System Security

Minimally, a computer system should

have controls that make the enemy work harder than the gain is worth. These controls include security kernels (a "software lock" thet allows access only to specific, authorized terminals and users), exception reports (an internal system in which the computer flags any unusual transaction), logging cutoffs (e system that prevents remote computers from "spinning the dial" on the passwork lock until it finds one that works) end encryption codes (on sensitive local deta in storage as well es on data that are transmitted).

Auditing

Most companies audit their financial transactions from the standpoint of dollars but not number of transactions. However, Brant Allen found in a study of computer frauds that nearly 70 percent involved adding or deleting transactions to accounts payeble and payroll files that caused payments to be made to fictitious companies or nonexistent employees.

Generally, perpetrators of computer frauds are careful to make sure that the dollar amounts balance throughout. It is more difficult, however, to cover up additionel transactions. Hence, these also should be eudited to provide an additional measure of control.

People Security

People security is by far the most difficult aspect of controlling computer crime. Obviously, one level of people security is military-like clearance systems with stringent investigations into the backgrounds of computer personnel.

A second level involves divided duties, responsibilities, and authorizations so thet no one has eccess to everything and, even if he did, he wouldn't have a clear enough picture of the total system to do any serious damege.

But as we've seen, outsiders are able to penetrate supposedly secure systems with remarkable ease. Where do they get their information? The best source is computer clubs and electronic bulletin boards. Modern computer freaks "publish" computer access codes and passwords on local electronic bulletin boards for all to see and use.

Another wey of getting into systems is by going through the trash of the EDP room and remote terminal locations looking for passwords, file names, and eccess codes.

Still other more brazen heckers call EDP departments, represent themselves as programmers or consultants working for the mainframe manufecturer and request access information. Most of the time they get it—often without so much es a pleusible explanation.

Finelly, an excellent source of informetion is disgruntled employees or ex-employees.

How can you keep these foxes out of the chicken coop, particulerly when the fox is young, bright, well-trained, and lecking in athics when it comes to computers? As with other things in which people are the key, there are no easy answers.

However, perheps the information ebove will point in the right direction for devising an epproach thet will meet your needs and the needs of your company.

/PC

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Save anything you can display in graphics mode as a disk file -- up to 9 screens from the keyboard, or up to 255 screens under program control. Print anything on a graphics screen to paper. Load Frieze once and call it when you need it, works with BASIC, Pascal, FORTRAN, anything running under PC DOS. Printers now supported include IBM PC Printer, Epson MX80/MX100 with Graftrax, IDS 460G/560G, IDS Prism80/132, NEC 8032. Dumps color screens in full color to the IDS Prism/Color printer!

Requires 48K, Color Graphics Adapter, PC DOS $86.00

CLUTTER™ — Arcade action game for graphics or monochrome displays

Runs on the Compaq™ too! Chase ghosts around the screen with a killer photon that never stops moving—all you can do is plant mirrors in its path. But once planted, mirrors don't go away, and each zapped ghost leaves a black hole in its wake. It's easy at first—but the screen gets awfully crowded after awhile! Three levels of difficulty, sound may be switched off.

Requires 48K, PC DOS, BASICA $22.95

COMPRESS™ — Assembly language text file compression utility

Get more onto your archival backup disks—save time during XMODEM file transfers. Using Huffman encoding techniques, Compress™ reduces the size of ASCII text or data files by 40% or more. Fully compatible with CP/M-80 SQ/USQ utilities. Works on any machine running MS-DOS 1.1.

Requires 48K, DOS $22.95

DIFMASTER™

3-D Graphics Generator for Visicalc™ DIF files

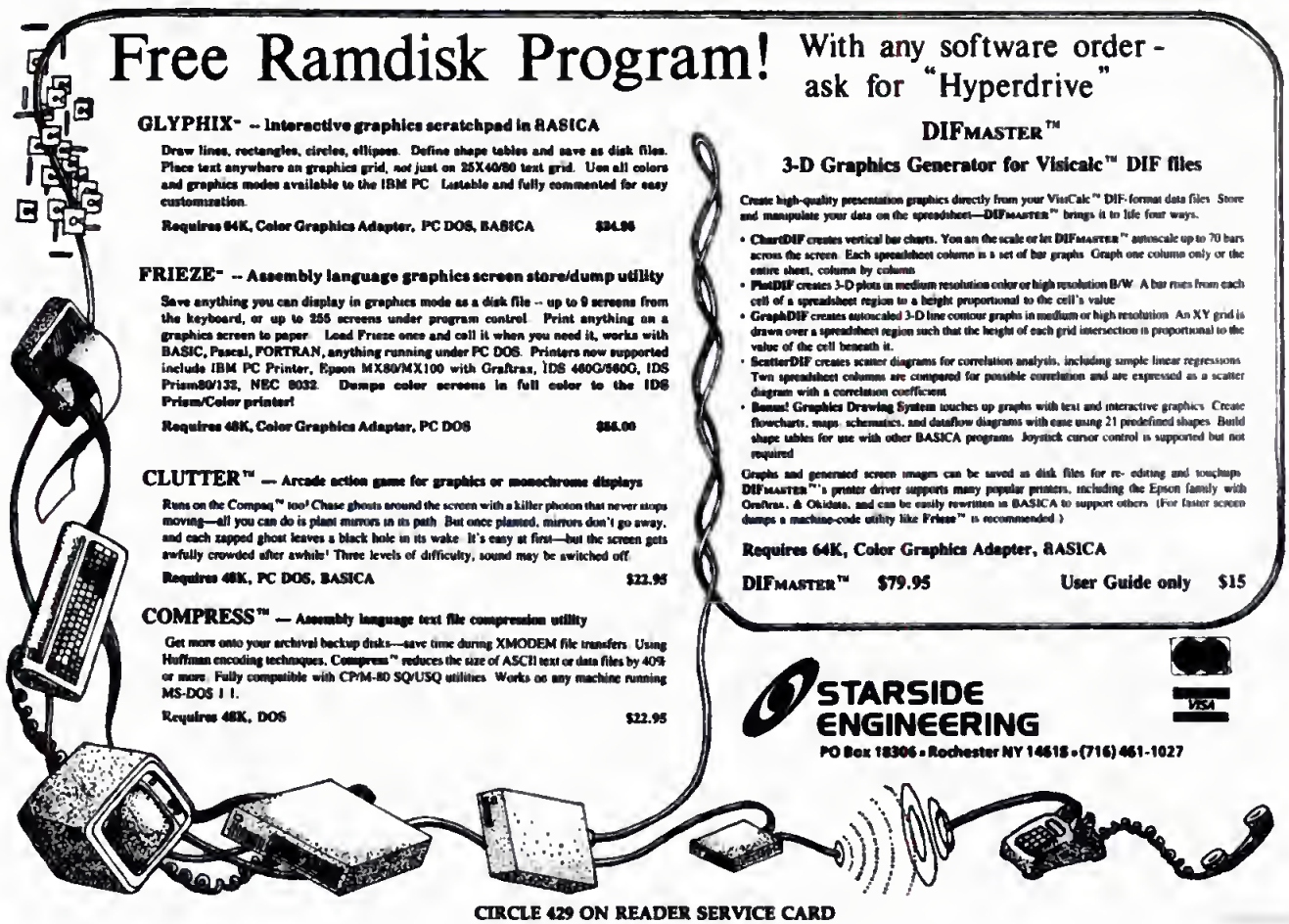
Create high-quality presentation graphics directly from your VisiCalc™ DIF-format data files. Store and manipulate your data on the spreadsheet—DIFMASTER™ brings it to life four ways.

- **ChartDIF** creates vertical bar charts. You an the scale or let DIFMASTER™ autoscale up to 70 bars across the screen. Each spreadsheet column is a set of bar graphs. Graph one column only or the entire sheet, column by column.
- **PlotDIF** creates 3-D plots in medium resolution color or high resolution B/W. A bar rises from each cell of a spreadsheet region to a height proportional to the cell's value.
- **GraphDIF** creates autoscaled 3-D line contour graphs in medium or high resolution. An XY grid is drawn over a spreadsheet region such that the height of each grid intersection is proportional to the value of the cell beneath it.
- **ScatterDIF** creates scatter diagrams for correlation analysis, including simple linear regressions. Two spreadsheet columns are compared for possible correlation and are expressed as a scatter diagram with a correlation coefficient.
- **Bonus! Graphics Drawing System** touches up graphs with text and interactive graphics. Create flowcharts, maps, schematics, and dataflow diagrams with ease using 21 predefined shapes. Build shape tables for use with other BASICA programs. Joystick cursor control is supported but not required.

Graphs and generated screen images can be saved as disk files for re- editing and touchups. DIFMASTER™'s printer driver supports many popular printers, including the Epson family with Graftrax, & Okidata, and can be easily rewritten in BASICA to support others. (For faster screen dumps a machine-code utility like Frieze™ is recommended.)

Requires 64K, Color Graphics Adapter, BASICA

DIFMASTER™ $79.95 User Guide only $15



STARSIDE ENGINEERING

PO Box 18306 • Rochester NY 14618 • (716) 461-1027

CIRCLE 429 ON READER SERVICE CARD

New On The Market

HARDWARE

PConnection

A plug-in telecommunications card with a direct connect modem, a real time clock, and an additional serial I/O port to increase the communications capabilities of the PC. All components are mounted on a single board with gold-plated edge connector fingers that plug into the PC.

The PConnection also provides autodial, touch tone or pulse dialing and autoanswer functions in both answer and originate modes. *(List Price: $375; modem ovoiloble for $279)*

Microperipheral Corp.
2585 152nd. Ave. N.E.
Redmond, WA 98052
(208) 881-7544

CIRCLE 700 ON READER SERVICE CARD

Video Printer

A video film recording unit that produces 35mm slides or photographic prints of the user's video display. Features include automatic film advance and rewind and a port for previewing the image to be captured. *(List Price: $2,495)*

Requires: Color board, 35mm film, ASA-64 Ektachrome.

Computer-Mote, Inc.
1008 Homshire Lane
Richardson, TX 75060
(800) 527-3643
(800) 442-4008 in Texos
(214) 869-2380 in Dallos

CIRCLE 656 ON READER SERVICE CARD

Multiple Adoptor Interfoce, Amdek Corporation

Multiple Adapter Interface (MAI)

A MAI board that provides memory extension, monochrome or color video and a printer adapter on a single plug-in module.

The board contains 128K bytes of RAM that is user allocated to the given function. A two position DIP switch is used to configure the board for monochrome video display or color graphics applications in the M/C (monochrome/color) switch position. in the second switch position, MM, the user allocates 96K bytes to user memory leaving 32K bytes for use in the video mode, or allocates the full 128K bytes to the video mode.

The MAI is capable of operating in any one of the four IBM compatible modes for color graphics: 40×25 elphanumeric, 80×25 alphanumeric, 320×200 four-color or 640×200 black and white.

in the modes, the MAI board's high density 128K of user memory allows the computer to store more data with better picture enhancement. *(List Price: $799)*

Amdek Corporation
2201 Lively Blvd.
Elk Grove Villoge, IL 60007
(312) 364-1180
TWX: 25-4788

CIRCLE 630 ON READER SERVICE CARD

ASCI PC Switch, Advonced Systems Concepts, Inc.

ASCI PC Switch

A set of 22 switches that allow all RS-232C printers, plotters, terminals, and modems to be networked to the PC. Parallel switches that allow networking with the IBM printer are also included. The three variations of the unit are the APTA series, which allows one computer to interface with two peripherals; the API series, which allows four computers, modems, or terminals to share a common unit such as a letter quality printer; and the APO series, which allows a single port to select or poll one of four output devices.

Networking applications for this product line range from networking a letter quality printer to four PC's, to networking a modem to a multiple computer system. The input and output ports of the units can be controlled automatically by sending one of 128 user selectable ASCII codes. Each unit can be controlled from remote locations by terminals, modems, or computers. *(List Price: Ronges from $345 to $589; discounts ovoiloble)*

Advonced Systems Concepts, Inc.
435 North Lake Ave.
Posadeno, CA 91101
(213) 793-8972

CIRCLE 660 ON READER SERVICE CARD

answerRAM

A multi-function RAM board designed for business and professional PC users. It has three I/O ports and is configurable with 64K, 128K, 192K, and 256K of additional RAM. Two of the ports are asynchronous, serial communications ports, and the third is a parallel printer port configured with e standard Centronics Interface. Connectors are supplied for both serial and parallel interfaces, end an optional factory-bullt "3-into-1" cable is eveileble thet permits take-off of all three ports from e single heavy-duty 37-pin connector in the standard rear-expansion slot of the PC.

All memory is IBM compatible with full parity checking. The manufacturer supplies software for electronic-disk application and print spooling es well as a routine that permits the user to change the system defeult printer with a keyboard command. *(List Price: 64K $595; 126K $716; 192K $637; 256K $958)*

Anotron, Inc.
202 West Bennett St.
Saline, MI 48176
(600) 521-0521
(300) 429-2678

CIRCLE 651 ON READER SERVICE CARD

onswerRAM, Anotron, Inc

Z8 BASIC System Controller Board

A small board containing a tiny BASIC interpreter, up to 6K RAM and EPROM memory, an RS-232 serial Interface with switch-selecteble baud rates, and 2 parallel ports. The board is fully-expandable to 124K and has been optimized for use as a dedicated controller. Connecting a CRT terminal allows immediate programming in BASiC or machine languege, and programs can be transferred to 2732 EPROMs with optional EPROM programmer for eutostart application. *(List Price: $199)*

The Micromint, Inc.
561 Willow Ave.
Cedorhurst, NY
(600) 645-3479

CIRCLE 588 ON READER SERVICE CARD

Model 2216 ADC

An extremely fast analog-to-digital (ADC) converter that converts an analog voltage to a 16-bit digital number in less than 5 microseconds.

The 2216 consists of two piggy-back, high-quality, epoxy-filled, glass-etched circuit cards which, plugged together, form a single plug-in module. It can be used independently or with other analog modules to form a complete system. *(List Price: $1,500)*

Tustin Electronics Company
1431 E. St. Andres's Ploce
Sonto Ano, CA 92705
(714) 549-0391

CIRCLE 587 ON READER SERVICE CARD

MicroTerm

A menu-driven smart terminal program with translation tables that allows the program to emulate eny type of terminal hardware. Its dialing menu allows the user to auto dial any one of 10 preset numbers. Additional numbers may be kept in other configuration files and loaded in seconds. It supports most major brands of modems including auto dial in both command and pulse dial modes. Spooled printer output allows slower printers to stay on line. The program can operate at 1200 baud and in some cases, up to 9600 baud, without insertion of null characters. *(List Price: $79.95)*

Requires: Available from manufacturer.

Micro-Systems Software Inc.
4301-18 Oak Circle
Boca Roton, FL 33431
(800) 327-8724
(305) 983-3390

CIRCLE 586 ON READER SERVICE CARD

New on the Market does not review products, but reports information provided by the manufacturer. If you have a product you would like to have included in this section, send a brief description that includes applications, price, and system requirements to New on the Market, PC, One Park Ave., New York, New York 10016. Photographs and illustrations are run on a space-available basis.

New On The Market

AJ 1259-AD

An auto-dial/auto answer triple modem that is compatible with the Bell 212A and VA 3400 series modems at 1200 bits/s and with Bell 103/113 modem at 300 bits/s.

The modem eliminates the need for a telephone set on the data line. Terminel users can now dial direct from any associated terminel keyboard. They can also enter, store and automaticelly diel up to 10 telephone numbers through simple keyboard commends.

The unit is microprocessor-controlled and offers continuous self-test and comprehensive diagnostics features. When answering e call, it automatically selects the appropriate communication protocol and data rate. It also allows direct access to stored numbers and a simple write-over to change. *(List Price: $875; lease price, $60 per month)*

Anderson Jacobson, Inc.
521 Chorcot Ave
Son Jose, CA 95131

CIRCLE 566 ON READER SERVICE CARD

Winchester Disk Drives

An interface series of Winchester disk drive subsystems to provide up to 15.9 megabytes of formatted storage. Each disk drive subsystem includes the 5¼ inch Winchester drive, cebinet, power supply, cable, connector, I/O adepter, end softwere (JEL) for DOS 1.1.

The drives have e track density of 345 tracks per inch. Track-to-track access time is 2 milliseconds with an average access time of 65 milliseconds. A mean-time-between-failure of 10,000 bours et 100 percent duty cycles insures drive reliability.

Other features include a 512-byte full-sector buffer, e 32-bit ECC, and autometic interleaving capebilities. The disk system uses 175 watts power and offers a choice of AC opereting voltages. *(List Price: $1,695 for 5.3 megobytes formotted storoge; $1,995 for 10.6; $2,295 for 15.9)*

Requires: Available from manufacturer.

Interfoce, Inc.
7630 Alobamo Ave.
Conogo Pork, CA 91304
(213) 341-7914

CIRCLE 574 ON READER SERVICE CARD

AJ 1259-AD, Anderson Jacobson, Inc.

SOFTWARE

Financial Planner Release 220

A financiel manegement program that interfeces with the dBASE II detebase menegement system.

The program provides users with a system for the construction of spreadsheet applications. The Releose 220 can interface with external files. The dBASE II interfece is called with a special commend from either the Rules section or the interactive processor. Tbe interface with externel files is invoked by adding an arithmetic operetor to the read and write statements. *(List Price: Avoiloble from monufocturer)*

Requires: Available from manufacturer.

Ashton-Tote
10150 W. Jefferson Blvd.
Culver City, CA 90230
(213) 204-5570

CIRCLE 624 ON READER SERVICE CARD

DEMO-DX

A self-teeching, self-demo disk for the Interactive Deta Meneger (IDM-X). It demonstrates how to create e simple data file, use most of the basic commends, end create several reports.

The package consists of a disk with instructions on the label. *(List Price: $9)*

Requires: 64K, e monochrome display, dual disk drives.

Micro Architect Inc.
96 Dothon St.
Arlington, MA 02174
(617) 643-4713

CIRCLE 575 ON READER SERVICE CARD

WordPlus-PC

A fully-featured word processing system for the PC which is also compatible with the new PC-XT.

The program has been designed to be "keyboard specific" for the PC (and the XT) end takes edvantage of each computer's capabilities, including the special function keys. It features a Color Coded Key Cap system to bypass the need for memorizing complicated codes. *(List Price: $395)*

Requires: 64K, one disk drive, DOS, can be loaded onto hard disk.

Professionol Software Inc.
51 Fremont St.
Needhom, MA 02194
(600) 343-4074

CIRCLE 573 ON READER SERVICE CARD

MIRACULOUS MENU MANAGER

A program that allows users to execute eny function the operating system is capable of performing by pressing a single keystroke. The user has the choice of wbat functions are to be performed, whet keys can perform the function, and what prompts to use. The program comes with a set of predefined functions to use or replace. *(List Price: $39.95)*

Requires: 64K, one disk drive, 60-column display, PC-DOS.

The Computer Workshop Inc.
322 Sheldon Ave.
Houghton, MI 49931
(906) 462-6009

CIRCLE 628 ON READER SERVICE CARD

MEDICAL RECORDS SYSTEM

SYSTEM FEATURES

PATIENT RECORDS

Patient Master
- Instant Access for Inquiry or Correction
- 8 Digit Alpha or Numeric ID Number
- Full Patient Data Including
  - Employer
  - Occupation
  - Referred By
  - Insurance Data
  - Receivables Ageing

Patient Activity
- Full History Maintained
- Accident Records Includes
  - Date of Accident
  - Date off Work
  - Date Returned to Work
  - Where Accident Happened
  - How Accident Happened
- Treatment Record Includes
  - Date of Visit
  - Diagnosis
  - Treatment
  - Charges
  - Condition Text
  - Comments Text
- Payment Records Include
  - Date
  - Amount
  - Source of Payment
  - Comments Text
  - Special Adjustments

PRACTICE INFORMATION

Centralized Customization of Practice Information
Up to 999 Treatment Descriptions & Prices
Up to 999 Insurance Co. Name & Address
Up to 999 Diagnosis Codes
Screen Prompting of Diagnosis Codes
Interactive Inquiry/Correction/or Addition
Printed Documentation of All Practice Information
Monthly Practice Analysis

ACCOUNTS RECEIVABLE

Automatic Insurance Form Printing
- Medical
- Medicare
- General Insurance
- Workmans Comp

Patient Statements
- Window Addressing
- Full History or Open Item Detail
- Past Due Text (Redefinable)

Management Reports
- 30/60/90 Aged Trial Balance
- Insurance Backlog Report
- Overdues Telephone List

Office Access
- Instant Status Inquiry
- Flexible Account Adjustments
- Daily Log Audit Trial
- Interactive Error Correction
- Patient Record Printout on Demand
- Alpha and/or Numeric Patient List

PRODUCT LINE

INFORET	$ 35.00
DATAENTR 200	$ 80.00
ISAM 100	$ 90.00
ISAM 200	$ 140.00
ISAM 300	$ 190.00
MEDICAL REC SYST	$2000.00
CHIRO REC SYST	$2000.00

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REDDING, CA 96049

CIRCLE 287 ON READER SERVICE CARD

New On The Market

Bid-Rite System and Take-Off Probe

A contractor's estimating system that measures lengths, area, and volumas with a devise that generates digital signals for computer processing. As the probe is movad along a drawing to taka a maasuremant, tha wheel turns and its movamant is datected by a bigh-resolution optical sensor that generates a digital pulsa for aach bar passed under tha sensor. The bars are located on a small drum that forms part of tha wbeel.

In the astimating procass, tha astimator calls up parts or groups of parts from a cetalog of standards, applies the measurement and/or count. Tha results are writtan to a fiie for latar recall on the screen or through a series of printed reports. Othar faatures includa variabla labor rates and materiai mark-up categories, keyboard-entared difficulty factors, standard checklists, and Job Cost budget setup. *(List Price: $2,540, includas programs, RS 232 measuring probe, ond monuol)*
Requires: 64K RAM, CP/M, 200K for programs.
MANDAT SYSTEMS
11155 120th Ava. N.E.
Kirklond, WA 98033
(604) 856-6441

CIRCLE 571 ON READER SERVICE CARD

Inventory and Bill of Material

A manu-drivan program for manufacturing companias that can invantory up to 90 diffarent finished products and up to 999 different part numbers. Each product can hava as many as 400 part numbers on its bill of material. Tha program offers three manus with fifteen selections and usarfriendly instructions. its available functions includa, among others: automatically deducting all bill-of-matarial parts from inventory when a finishad product is shipped; computing total invantory cost at any tima or tha materiai cost of any product; listing all parts with a unit cost over a given amount or with a total cost ovar a givan amount; listing all parts shown to be at or below tha reorder point; returning all parts to invantory if a finished product is returned. *(List Price: $695)*
Requires: 64K, two disk drives, printer.
Cyclo-Tronics, Inc.
1345 N. Old Rand Rd.
Woucondo, IL 60084
(312) 526-0800

CIRCLE 615 ON READER SERVICE CARD

Bid-Rite System and Take Off-Probe, MANDAT SYSTEMS

GolfCap

A software packaga that will anabla golf laagues, golf courses and country clubs to calculata and sava golf-handicap information for large numbers of golfers.

The program calculates USGA-typa golf handicaps for 250 golfers per single-sided disk and stores up to 20 scores for aach golfar. It will print lists by name or by handicap, wallet-sized cards for each golfer or small stickers for bag tags with name and handicap. It is dasignad to ba used by inaxparianced and novice computer users. *(List Price: $49.95)*
Requires: 64K, an 80-column display and a printer.
Systemics
3050 Spring
Wast Bloomfiald, MI 48033
(313) 851-2504

CIRCLE 576 ON READER SERVICE CARD

Depreciation Pak

A menu-driven depreciation program that permits salection of any of seven different depreciation mathods. Tha alternativas include straight-lina, sum-of-the-yaars digits, and accalarated cost recovary with current IRS parcantagas or four different parcantages basad on declining balance. User has tha option of generating a raport of annual totals on screen or a detailed printed report. *(List Price: $90)*
Requires: 48K, one disk drive, printar.
Software Integrated Systems
440 S. Fadarol Hwy.
#W-2
Deerfield Baoch, FL 33441
(305) 427-2118

CIRCLE 613 ON READER SERVICE CARD

UltraBOOT

A dynamic memory allocation utility program that provides usars with the maximum possibla varsatility in choosing bow much memory will be available for user programs.

The utility has somawhat tha sama affect as changing the computer's internal switchas, but is operated from tha keyboard. The program also sets tha availabla numbar of disk drivas up through four. When installed the program updates tha top of mamory pointer and "warm boots" tha operating system from Drive A.

Also includad with *UltraBOOT* on tha *UltraFAST* software disk is *UltraFAST*, a flexibla disk RAM amulator and UltraTRAP, a parity arror handling utility. *(List Price: $39.95, or free whan purchosed with 512K memory board, $895)*
Requires: DOS.
Doystar Systams, Inc.
10511 Church Rd., #L
Dollos, TX
(214) 341-8136

CIRCLE 565 ON READER SERVICE CARD

Sapana-LetterMerge

A manu-drivan program to print form lettars. Tha program merges the addresses from a mailing list created by the manufacturer's mailing list program *Sapano-Mail-Trock I* with tha lattars prepared by *WordStar*, *EosyWriter*, *EDLIN*, or other editors or word processing programs that create DOS-compatible ASCII fiies.

Features include the ability to merge selected labels belonging to specified groups and print the form letters; ability to print multiple copies of letters, and emergency return to main menu in most instances. *(List Price: Free to owners of Mail-Treck-I program if they send in their original program disk and $5 to cover postage and handling)*
Requires: 64K, one disk drive, 80-column display, parallel printer, DOS.
Sopano Micro Software
1305 South Rouse
Pittsburg, KS 66762
(316)231-5023

CIRCLE 563 ON READER SERVICE CARD

EZ Entry

A simple invoicing and on-screen order-entry program designed to be used by novice PC users and small businesses. Program is self-documented and includes DOS, BASICA, and source code. It enables the user to store 200 product codes and prices and 500 orders per single-sided disk. Automatic extension and sales-tax computation is provided. Interface utility with accounting software is available. Hard-disk and double-sided disk versions are available. *(List Price: $99.95)*
Requires: 64K, monochrome display, two disk drives, dot-matrix printer.
Systemics
3050 Spring St.
West Bloomfield, MI 48033
(313) 851-2504

CIRCLE 614 ON READER SERVICE CARD

Typing Teacher

A program designed to teach users to type with speed and accuracy. It maintains individual figures on typing speed and accuracy, compares the current typing session with the previous session, and reports on the typist's progress.

The *Typing Teacher* contains menu selections for beginning typing, advanced typing, stored text matching, text file creation and maintenance, listing the text directory on the screen, printing the text files or directory on the printer, and creating a new text directory. *(List Price: $29.95)*
Requires: 64K, one disk drive, 80-column monochrome display, 80 cps Matrix printer, BASICA.
SimSoft, Inc.
1258 17th St.
Marysville, MI 48040
(313) 364-7241

CIRCLE 695 ON READER SERVICE CARD

Vector Sketch

An inexpensive CAD software package suitable for generating business graphics; space planning; and construction, architectural, mechanical, and electrical designs. It is to be used in conjunction with a Digi-Pad 5 digitizer. The package enables the operator to input drawings by entering data via a digitizer. Vectors are displayed on the graphics monitor and can be stored onto disk, plotted in sizes up to 24-inches by 36-inches or printed on a dot-matrix printer.

Drawings can be traced or made from simple components such as lines (5 styles), circles, arcs and boxes. A Zoom facility enables users to draw to the smallest level of detail. Objects may be aligned to grid boundaries or to the nearest vector. *(List Price: From $2,995, includes a 0.001-inch resolution digitizer)*
Requires: Digitizer (supplied by GTCO), dual disk drives, graphics monitor and card, 256K RAM, asynchronous adapter.
GTCO Corporation
1055 First St.
Rockville, MD 20850
(301) 279-9550
Telex: 896471

CIRCLE 583 ON READER SERVICE CARD

Vector Sketch, GTCO Corporation

The RoseWare Directory

A menu-driven module which provides access to keyed subsets of similar products selected by the user from more than 2,000 PC-compatible products offered by over 900 vendors.

A typical product selection lists the product name, model number, current list price, hardware and software requirements, and a vendor-supplied description, including the vendor's address. Users can print out a complete product page and/or mailing labels. The data base is updated every six months *(List Price: $30)*
Requires: 64K, one disk drive, an 80 column monitor, and printer.
The RoseWare Directory
1015 Gayley Ave., #323
Los Angeles, CA 90024
(213) 457-7110

CIRCLE 654 ON READER SERVICE CARD

New On The Market

Night Mission Pinball

An arcade simulation program that recreates the look and sound of a real pinball table. The playfield has five humpers, seven standup targets, nine rollovers, and is interlaced with sound routines to add to the realism of the play.

The game's theme is based on a World War II night bombing run. Completing the NIGHT lane-lite rollover sequence turns on the rollover lane arrows and activates a series of "bomb release line" city targets. Four standup targets control a bonus multiplier. A hole kicker can catch your ball, activating any one of a number of possible bonus features before ejecting the ball back into play. The game allows users to keep up to four balls in play simultaneously.

The game also offers 10 user-selectable modes of play to enable the player to modify the pace or the difficulty of play. Another feature allows users to create and save up to 100 custom modes of their own design. *(List Price: $39.95)*

Requires: 64K, color/graphics monitor adapter.

subLOGIC Corporation
713 Edgebrook Dr.
Champaign, IL 61820
(217) 359-8482
Telex: 206995

CIRCLE 582 ON READER SERVICE CARD

Night Mission Pinball. subLOGIC Corporation

GRAPHWRITER

A professional quality business graphics software package which is the software component of a separate business graphics system.

With the program and a pen plotter, users can produce presentation graphics on paper or transparency from a catalog of over 40 business graphics formats including pie charts, bar charts, line charts, organization charts, Gantt charts, bubble charts and others.

The program will be sold in two sets, the Basic Set and the Extension Set. A two-pen plotter is also available. *(List Price: $395 for one set, $750 for both sets, $1,500 for two-pen plotter)*

Requires: 128K, two disk drives, RS-232 asynchronous port, plotter.

Graphic Communications, Inc.
200 Fifth Ave.
Waltham, MA 02254
(617) 890-6778

CIRCLE 621 ON READER SERVICE CARD

WS-PATCH, WS-KEYS

Two programs for use with WordStor. *WS-PATCH* enables PCs equipped with dot matrix printers to print five different character sizes in a variety of type styles. Superscripts, subscripts and underlining are also possible. *WS-PATCH* amends the print control menu in WordStor so that new printing capabilities and their associated control code sequences are displayed when CNTL P is pressed.

WS-KEYS allows WordStor users to re-define the 10 IBM function keys to any command sequence or word up to six characters long. *WS-KEYS* can be re-run as often as needed. *(List Price: $39.95, $24.95 WS-KEYS only)*

Requires: Available from manufacturer.

CMB3 Enterprises
1412 Gotewood Court
Martinez, CA 94553
(415)372-7733

CIRCLE 561 ON READER SERVICE CARD

HEY DIDDLE DIDDLE

A collection of 30 classic nursery rhymes festuring color graphics and music. This learning game helps children understand how words and rhythms create poetry and even lets them take fragmented thoughts and rearrange them to form coherent verse.

The program consists of material appropriate for three levels. STORYTIME, for pre-readers, is a continuous display of 30 rhymes with pictures and music for the child to watch and enjoy. STORYBOOK (for beginning readers) lets the child see each rhyme formed in slow motion with words and pictures. RHYMEGAME (for more advanced readers) presents two levels of play. The child can choose to unscramble either the first four lines or the entire eight-line nursery rhyme. Racing against the clock or another player, the child attempts to rearrange the lines in the correct order. *(List Price: $29.95)*

Requires: Available from manufacturer.

Spinnaker Software
215 First St.
Cambridge, MA 02142
(617) 666-4700

CIRCLE 585 ON READER SERVICE CARD

HEY DIDDLE DIDDLE, Spinnaker Software Corp.

Quality Disk Software from SPECTRUM

Apple II

IBM PC

PERSONAL FINANCE MASTER

The premier personal and small business financial system. Covering all types of accounts including check registers, savings, money market, loan, credit card and other asset or liability accounts, the system has these features:

- Monthly Transaction Reports
- Budgets Income & Expense
- Reconciles to Bank Statements
- Prints Checks & Mailing Labels
- Automatic Year-End Rollover
- Prepares a Net Worth Report
- Searches for Transactions
- Handles Split Transactions
- User-Friendly Data Entry Forms
- Fast Machine Language Routines
- Extensive Error Trapping
- HI-RES Expense/Income Plots

For Apple II (4BK) & IBM PC $75.00
Manual & Demo Oisk only $15.00

COLOR CALENDAR

Got a busy calendar? Organize it with Color Calendar. Whether it's birthdays, appointments, business meetings or a regular office schedule, this program is the perfect way to schedule your activities. The calendar display is a beautiful **HI-RES** color graphics calendar of the selected month with each scheduled day highlighted in color. Using the daily schedule, you can review any day of the month and schedule an event or activity in any one of 20 time slots.

For Apple II (48K) $30.00

BUSINESS SOFTWARE SERIES

Both Programs $250.00

A user-friendly yet comprehensive double-entry accounting system employing screen-oriented data input forms, extensive error-trapping, data validation and special routines for high speed operation. The series includes these two modules:

GENERAL LEDGER: A complete accounting system with these features:

- Up to 500 accounts and 500 transactions per month.
- Interactive on-screen transaction journal
- Prints checks and mailing labels.
- Produces these reports:
  - Transactions Journal
  - Account Ledgers
  - Income Statement
  - Balance Sheet
  - Account Listings

For Apple II (4BK) & IBM PC $150.00

ACCOUNTS RECEIVABLE

A flexible system with these features

- Up to 500 accounts and up to 500 invoices per diskette.
- Prints invoices, customer statements & address labels.
- Interfaces to General Ledger.
- Interactive screen-based invoice work sheet.
- Produces these reports
  - Aged Receivables
  - Sales Analysis
  - Account Listings
  - Customer Balances

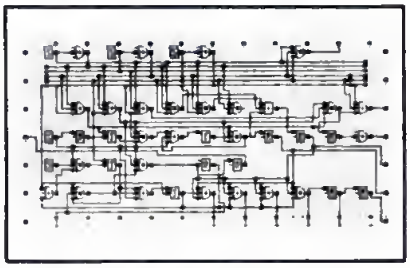
For Apple II (48K) & IBM PC (2 ORIVES) $150.00

LOGIC DESIGNER & SIMULATOR

An interactive **HI-RES** graphics program for designing and simulating digital logic systems. Drawing directly on the screen the user interconnects gates, including **NAND, NOR, INVERTER, EX-OR, T-FLOP, JK-FLOP, D-FLOP, RS-FLOP, USER-DEFINED MACRO** and **N-BIT SHIFT REGISTER** types. Network descriptions for the simulation routines are generated automatically.

The program is capable of simulating the bit-time response of any logic network responding to user-defined source patterns. It will simulate networks of up to 1000 gates. Includes a source pattern editor, **MACRO** editor and network editor. Produces a fan-out report. Simulation output is a string of 1's & 0's representing the state of user selected gates for each bit time of the simulation.

A typical page of a logic drawing looks like this:



For Apple II (48K) & IBM PC (2 ORIVES) $250 00

MANUAL AND DEMO DISK: Instruction Manual and demo disk $30.00

MATHEMATICS SERIES

The Series Includes These 4 Programs:

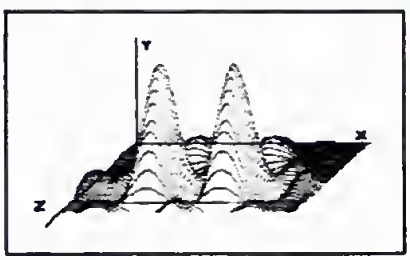
STATISTICAL ANALYSIS I: This menu driven program performs **LINEAR REGRESSION** analysis, determines the mean, standard deviation and plots the frequency distribution of user-supplied data sets.

NUMERICAL ANALYSIS: HI-RES 2-Dimensional plot of any function. Automatic scaling. At your option, the program will plot the function, plot the **INTEGRAL**, plot the **DERIVATIVE**, determine the **ROOTS, MAXIMA, MINIMA** and **INTEGRAL VALUE.**

MATRIX: A general purpose, menu driven program for determining the **INVERSE** and **DETERMINANT** of any matrix, as well as the **SOLUTION** to any set of **SIMULTANEOUS LINEAR EQUATIONS.**

3-D SURFACE PLOTTER: Explore the **ELEGANCE** and **BEAUTY** of **MATHEMATICS** by creating **HI-RES PLOTS** of 3-dimensional surfaces from any 3-variable equation. Disk save and recall routines for plots. Menu driven to vary surface parameters. Hidden line or transparent plotting.

For Apple II & IBM PC. $50.00

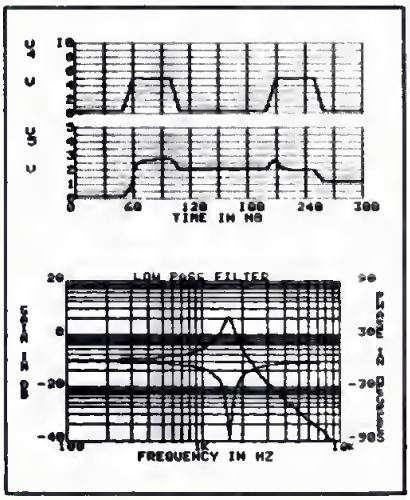


μCAP

Microcomputer Circuit Analysis Program

Tired of trial & error circuit design? Analyze and debug your designs before you build them. With **μCAP** you simply sketch your circuit diagram on the CRT screen and run an **AC, DC** or **TRANSIENT ANALYSIS.** Your circuit may consist of **RESISTORS, CAPACITORS, INDUCTORS, DIODES, BATTERIES, BIPOLAR** or **MOS TRANSISTORS, OPAMPS, TRANSFORMERS,** and **SINUSOIDAL** or **USER-DEFINED TIME DEPENDENT VOLTAGE SOURCES. μCAP** can analyze any such network containing up to 40 separate nodes. Includes a user controlled **MACRO** library for modelling complex components such as **OPAMPS** and **Transistors.**

Typical **μCAP AC** and **Transient Analysis** graphs:



For Apple II (48K) & IBM PC (2 ORIVES)$475.00
Manual & Demo Oisk $30.00

ORDERING INSTRUCTIONS: All programs are supplied on disk and run on Apple II (4BK) with a Single Disk Orive or IBM PC (64K) with Single Oisk Orive unless otherwise noted. Oetailed Instructions included. Orders shipped within 5 days. Card users include card number. Add $2.00 postage and handling with each order. California residents add 6½% sales tax. Foreign orders add $5.00 postage and handling per product.

SPECTRUM SOFTWARE
690 W. Fremont Ave.
Sunnyvale, CA 94087

VISA

FOR PHONE ORDERS:
(408) 738-4387
DEALER INQUIRIES INVITED.

New On The Market

MATH BLASTER

An educational software product that turns the computer into an effective instructional tool as well as a math arcade game.

The program contains over 600 problems in addition, subtraction, multiplication, division, fractions and decimals for students aged 8 through 12. The problems are grouped in "families of facts" and can be used with four different learning activities, including a fast-action arcade game.

The program also contains an editor that allows the user to enter new problems in any of the four learning activities. *(List Price: $49.95 includes 2 disks and manual)*

Requires: Available from manufacturer.

Davidson & Associates
8069 Groveoak Place, #12
Rancho Palos Verdes, CA 90274
(213) 378-7826

CIRCLE 568 ON READER SERVICE CARD

COST-ACUMEN

A cost accounting and project management program for architectural and engineering firms, research and development groups, and other professional consultants. The program requires no previous computer background and adapts to existing ways of doing business. Extensive cross-checks ensure accuracy of processed information. *(List Price: $995, demonstration copy $95, cost is deductible from total)*

Requires: CP/M 86.

Computer Applications Corporation
Program Products Division
2400 Poplar Ave., #316
Memphis, TN 38112
(901)458-8630

CIRCLE 562 ON READER SERVICE CARD

SIM3278

A software package that links microcomputers and asynchronous terminals to IBM mainframe computers. This protocol conversion software provides for the full-screen functions of an IBM 3276 while using an inexpensive ASCII video display terminal without any hardware or operating system modifications or additions. Up to 255 terminals per simulator and over 30 different terminal types can be supported.

The program operates essentially by translating 3270 data streams into ASCII control sequences, valid for the specific type of CRT and vice versa. The software is completely table-driven, supports any mix of terminal types, and allows terminals to be physically located anywhere. The package includes several unique features, such as a multiple-session manager, online Help, and host-to-micro data transparency. *(List Price: $5,500 per single CPU license, with operation/installation manual and 30-day free demonstration tape)*

Requires: Available from manufacturer.

AZTEK Computing Inc.
989 Bronson Ave., #212
Ottawa, Ontario, Canada K1S 4G8
(613) 235-6736

CIRCLE 579 ON READER SERVICE CARD

NBI Word Processing

A professional-level word processing program available for the PC and the PC-XT. Available functions include form letters; printing while editing; automatic centering; indent; word wraparound; outline formatting; disk password security; an alphabetized, printable directory; typewriter mode, which allows line-by-line printing for forms and envelopes; block copy; move and delete; decimal tabs; delete character, word, line and block; display of page breaks and document insertion. User-assist menus are available at three increasing levels of detail.

There is a training guide, reference guide, reference card and an adhesive-backed keyboard layout.

The program includes an NBI co-processor board. It inserts into the PC and provides 64K bytes of memory and space to allow memory expansion in 64K increments up to a maximum of 192K bytes. The program supports a variety of character and dot matrix printers. *(List Price: $695)*

Requires: One disk drive, 80 by 25 monitor, 64K RAM, printer.

NBI
P.O. Box 9001
Boulder, CO 80301
(800) NBI-1111

CIRCLE 567 ON READER SERVICE CARD

NBI Word Processing, NBI

Fast Graphs, Innovative Software

Fast Graphs

A color grephics program that can draw color charts, graphs, or pictures representing business or sclentific data.

The program produces high-resolution color pictures on the display screen or on plein paper. The program elso allows users to create a chart on the color display then seve it to disk or print it on a printer or plotter. The system is pre-programmed to draw bar, pie, or llne charts wlth shadows, circles, boxes, arcs, line or points. Fest Graphs can teke deta from the keyboard, but it can also create color charts from data contained in the manufacturer's T.I.M. detabase manager program or VisiCalc DIF files.

Charts can be labeled in two character sizes while mlxing more than one graphlng technique to a given chart. Bar graphs cen be oriented horizontelly or verticelly, comparatively or stacked, ln two or three dlmensions, using up to six data sets, and displayed in ectivity vs. time format, if the user so chooses. Plotting points can be designated by triangles, circles, or squares to make interpretetion easier.

Another progrem feature allows users to reproduce a company logo, save it on disk for future use, and place it anywhere on the chart. *(List Price: $295)*

Requires: 128K, two disk drives, color board, dispiay, and color graphics prlnter/plotter.

Innovotive Softwore
9300 West 100th St., #380
Overland Park, KS 86210
(913) 383-1089

CIRCLE 629 ON READER SERVICE CARD

The Statistician

A program of approximately 100 Fortran Subroutines on six disks. These subroutines are designed to aid the mathematician and scientist in performing mathematical functions. Both the compiled objects and sources are provided on the disks.

The subroutines cover data screening, correlation and regression, design, discriminant, factor, and time series analysis, nonparametric statistics, generation and distribution functions, matrix and storage operations, Eigen analysis, matrix and polynomial solutions, and linear analysis. *(List Price: $295)*

Requires: 128K, one single-sided disk drive, Fortran compiler. (258K, two disk drives recommended).

Alpha Computer Service
P.O. Box 2517
Cypress, CA 90630
(714) 894-8808

CIRCLE 581 ON READER SERVICE CARD

Small Fortune Auto-Ledger

A menu-driven general ledger designed to be used by people without prior accounting or computing experience. The program can accommodate several hundred income, expense, asset, llabllity and capital accounts and allows users to compare expenses to budget on a monthly, quarterly, or year-to-date basis and know the exact balances of all charge accounts, loans and notes at any time.

Using double entry for cash accounts, the system employs error-avoldance routines to lnsure the eccounts stay in balance. Single entry is also provided for non-cash transactlons. The user has the option of using account numbers, names, or e combinatlon of both.

The Reports Modules is a special program feeture thet includes a balance sheet end income statement that can be modified to the user's particular needs. *(List Price: $50)*

Requires: 64K, one disk drive, 80-column display. Printer is optional.

Emerald Softwore, Inc.
2418 Warren Ave., North
Seattle, WA 98109
(208) 282-2100

CIRCLE 639 ON READER SERVICE CARD

New On The Market

ReadiWriter

A document formatting system for form letters, books, or manuals. The program supports a variety of printers and printer features.

The program must be used with a word processing program that creates an edits the input documents. The *ReadiWriter* includes four major features; formatting capabilities include proportional spacing with micro justification, parametric printer definitions which allow support of almost any printer, compatibility with the IBM mainframe document composition facility GML and script languages, and a self-extension feature which allows building of new commands.

The program automatically generates tables of contents, accumulates numbers, pieces footnotes at the bottom of pages, numbers lists, adds page headings and footings, and builds indexes. Users can underscore, boldface, italicize, center or right align text. The program also builds tables with tabs even in proportional mode, and conditionally ends pages depending on room remaining. *(List Price: $95)*

Requires: 128K, two disk drives, MS-DOS.

ReadiWare Systems
P.O. Box 880
West Redding, CT 06896
(203) 431-3521

CIRCLE 645 ON READER SERVICE CARD

ColorBIZ Inventory

An inventory management program with an interactive database and report generator. The program allows users to handle such information as multiple stores, duel item or part numbers, location codes, and sizes. Online directions and full color user guide are included. Program can be run in black/white. Multi-color bar charts can be produced for analyzing various inventory situations. Password security is also included. Users can also create worksheets for set-up, analysis, and valuation. Usage and margin analysis by month and y-t-d can be created. Password security is also included. *(List Price: $498)*

Requires: 64K, one disk drive.

ColorCorp
208 North Berkshire
Bloomfield Hills, MI 48013
(800) 521-0793
(313) 335-2255

CIRCLE 644 ON READER SERVICE CARD

ColorBIZ Gambler

A casino games package that includes BlackJack, Becceret, and Keno. Users can select the type of casino, table minimums, dealer, colors, number of players and number of decks. Program can be run in black/white and keeps track of winnings, losses, and commissions. *(List Price: $28)*

Requires: 64K, one disk drive.

ColorCorp
208 North Berkshire
Bloomfield Hills, MI 48103
(800) 521-0793
(313) 335-2255

CIRCLE 641 ON READER SERVICE CARD

QUICK-TEXT

A fully integrated, full screen word processor and text editor for the novice or business user. It was designed with extensive use of sound, function keys, ghost cursor, and screen highlights. The system provides the features required to create, edit and print documents or files. The program can work with either *QUICK-TEXT* documents or standard DOS files.

A spelling aid is included that allows users to check spelling as words are entered. Checking is accomplished by placing the cursor anywhere on the word and pressing a function key. The spelling dictionary contains over 1,500 of the most frequently misspelled words and can be increased by the user.

Other features include autometic word wrap, right justification, charecter insert and delete, line centering, text reformat, left end right margin control, block move/copy/delete, and line tabs. *(List Price: $55)*

Requires: 64K, two disk drives, 80-column display, printer.

Distributed Software Systems
P.O. Box 1301
Northbrook, IL 60062
(312) 634-1511

CIRCLE 631 ON READER SERVICE CARD

ColorBIZ Loan

A program that analyzes numerous financing alternatives and allows for quick analysis of verious loan situations. The program can calculate any loan value, store loans, and print or display monthly or yearly amortization schedules. Users can check loan status for any period desired, determine balloon payoffs, or casb requirements. Program can be run in color or black/wbite. *(List Price: $28)*

Requires: 64K, single disk drive.

ColorCorp
208 North Berkshire
Bloomfield Hills, MI 48013
(800) 521-0793
(313) 335-2255

CIRCLE 642 ON READER SERVICE CARD

ColorBIZ BioRhythm

A program to aid the user in determining emotional, physical and intellectual cycles. Features include congeniality comparisons, display and graphic printout, and storage and retrieval of names/birthdetes through *BioRhythm* reference guide. Tbe program can be run in color or black/wbite. *(List Price: $27)*

Requires: 64K, one disk drive.

ColorCorp
208 North Berkshire
Bloomfield Hills, MI 48013
(800) 521-0793
(313) 335-2255

CIRCLE 640 ON READER SERVICE CARD

The Running Log

A program that acts as a log for runners storing and analyzing running date. The program stores up to 13 items per run for up to two runs per day. Several tables and graphs are provided to display data for viewing and analysis.

Log items loclude mlles, time, tempereture, course, speed, subjective ratlng, shoes, pulse, humidity, weight, notes, plus two items of the user's choice. The user may use as many or es few of the log items as desired. The log is adaptable to all levels ol runners. *(List Price: $44.95)*

Requires: 64K, two disk drives, graphics adapter, 80-column screen.

Morothon Software
Box 26 Pinecrest
Cloncy, MT 59634

CIRCLE 646 ON READER SERVICE CARD

Wordtrix

A word game that pits the pleyer against the PC. Both the player and the computer find words in a random grid of letters. Tbe PC includes a bullt-lo dictionary and multiple levels of play. Best scores are saved oo disk. *(List Price: $34.95)*

Requires: 64K, ooe disk drive, PC-DOS 1.0 or 1.1.

Insoft, Inc.
10175 SW Borbur Blvd.
#202B
Portlond, OR 97219
(503) 244-4181

CIRCLE 650 ON READER SERVICE CARD

The EXTERMINATOR

A maze game for one or two players. Players must navigate the maze and exterminate bugs before they destroy the player. Players must find the hidden cans of lnsecticide to win. Game features automatically increasing levels of difficulty, joystick or keyboard control. *(List Price: $29.95)*

Requires: 64K, one disk drive, color/graphics adapter, PC-DOS.

Distributed Softwore Systems
P.O. Box 1301
Northbrook, IL 60062
(312) 634-1511

CIRCLE 649 ON READER SERVICE CARD

FLIPPERBALL

A pinball-emulation game for ooe to four players that includes sound and graphics effects. Program allows users to compete for a "champlooship title," records high scores and uses left and right keyboard "flipper" control. *(List Price: $29.95)*

Requires: 64K, one disk drive, color/graphics adapter, PC-DOS.

Distributed Softwore Systems
P.O. Box 1301
Northbrook, IL 60062
(312) 634-1511

CIRCLE 648 ON READER SERVICE CARD

TE100 Version 1.1 and TE100-FT

Two terminal package emulation, designed to emulate the DEC VT100, VT101, VT102, and VT52 terminals. TE100 includes 75 to 9600 baud; full character attributes; keyboard emulation, including all special functloo keys used by DEC editors; line and character insert and delete; modificatloo of terminal characteristics from the host computer; and full local printer support. TE100 also allows the user to define four separate setup configurations to simplify communication with different host computer systems. In addition, each setup configuration can include teo "softkey" definitions containing ASCII sequances such as auto-dial and log-in commands.

TE100-FT is an extensioo of TE100 that adds bi-directional file transfer capabilities. It allows the user to capture data being sent to the terminal into a disk file, and to transfer ASCII programs or data filas to the bost computer. TE100-FT is also able to transmit and receive ASCII files using an "error-free" protocol designed to aliminate the problems of deta loss when transferring data over ooisy telepbooe lines. *(List Price: TE100 Version 1.1, $125; TE100-FT, $150)*

Requires: TE100 Versioo 1.1: 64K, one disk drive, monochrome or 80-column color monltor, PC-DOS. TE100-FT: 84K, two disk drives, monochrome or 80-column color monitor.

Persoft, Inc.
2186 U.S. Highwoy 51
Stoughton, WI 53589
(608) 673-8888

CIRCLE 684 ON READER SERVICE CARD

EDUBAS I and II

An educational software package designed for those who want to learn how to program with BASIC. *EDUBAS* I shows the first time user how to handle immediate mode, deferred mode, input/output functions, branching and loops, flow charting, graphics, subroutines, and debugging.

EDUBAS II deals with the advanced fuoctions of BASIC such as striog and sub-string manipulations, file manipulations (sequential and random), advanced graphics and colors, and advanced BASIC instructlons.

Each program iocludes three disks cootaining computerized lessoos, exercises, and instructions. *(List Price: EDUBAS I, $95; EDUBAS II, $105. Complete package, $170)*

Requires: 64K, ooe disk drive, DOS, BASICA, color graphic monitor adaptor, 80-column black-and-white or color screen.

Europro, Inc.
129 Sarotogo
Petolumo, CA 94952
(707) 763-9700

CIRCLE 675 ON READER SERVICE CARD

New On The Market

PC-ORDER ENTRY INVENTORY

A perpetual inventory system that can be incorporated into the manufacturer's *PC-ORDER ENTRY SYSTEM*. The inventory system provides a means of recording increases and decreases in the amounts of invantory. The system will maintain the quantities of stock-on-hand items and notify the operator when stock hes reached a zero or beck order point.

Features allow users to maintain quentity of stock-on-hand; maintain reorder points of stock items; reduce in-stock amounts when order is entered; produce a report of all items below the reorder point; highlight out-of-stock items whan the order is taken and update when new stock arrives. *(List Price: $50)*

Requires: 64K, two disk drives, *PC-ORDER ENTRY SYSTEM* program, 80-column display, printer.

Distributed *Softwore Systems*
P.O. Box 1301
Northbrook, IL 60062
(312) 834-1511

CIRCLE 632 ON READER SERVICE CARD

Freeform, Dimension Softwore Systems, inc.

NOVACALC

A spreadsheet/financial planner that can be usad to perform math, trig, log, sum, end average functions for depreciation (DEP), net present velue (NPV), rates of return (IRR), and true consolidation or roll-up (RUP) for 3-D spreadsheet operations. The program also features decimal and comma format control, selective column printing, wide carriege printing, help menu and halp screen, underlining, protected data fields, and sharing of data emong worksheets to avoid data re-entry. *(List Price: $24.95)*

Requires: 128K, two disk drives. Printer is optional.

Hourgloss Systems
P.O. Box 312
Glen Ellyn, IL 60137
(312) 690-1855

CIRCLE 653 ON READER SERVICE CARD

Freeform

A program designed to bring mainframe capabilities to smeller computers, providing over 60 users with up to 10 billion bytes of database. *Freeform* allows the office maneger or novice to perform complex operations without programmer assistance. The user can create custom applications for accounts payable, database applications, general ledger, and a wide ranga of other business requirements. Other features include screen formatting, report generetion, applicetion program generation, and graphics. *(List Price: $2,000 site license, $700 per program copy, discounts ovoiloble)*

Requires: 192K, one floppy disk, one serial port.

Dimension Softwore Systems, inc.
605 E. Sofori
Moil Stop C4
Grond Prairie, TX 75050
(214) 262-8201

CIRCLE 657 ON READER SERVICE CARD

Multi-Currency General Ledger

A menu-driven program that provides financial informetion by individual currency and consolidates balance sheet and income ststement data in different currencies into a single report. It will perform an eutomatic revaluation of foreign currencies to current rates, end calculate the profit and loss due to these rate movements. This program can also store transaction data, end may therefore be used to produce customer and due-to/due-from account ststements.

The *Multi Currency General Ledger* package also includes e seven lesson tutoriel program. This tutorial leads the user through a step-by-step instruction course, introducing and expleining each of the system's functions. *(List Price: $3,800)*

Requires: 64K, two disk drives, MS-DOS, printer.

Nissim Associotes
2714 Pine St.
San Francisco, CA 94115
(415) 583-6170

CIRCLE 658 ON READER SERVICE CARD

YOU DESERVE THE BEST

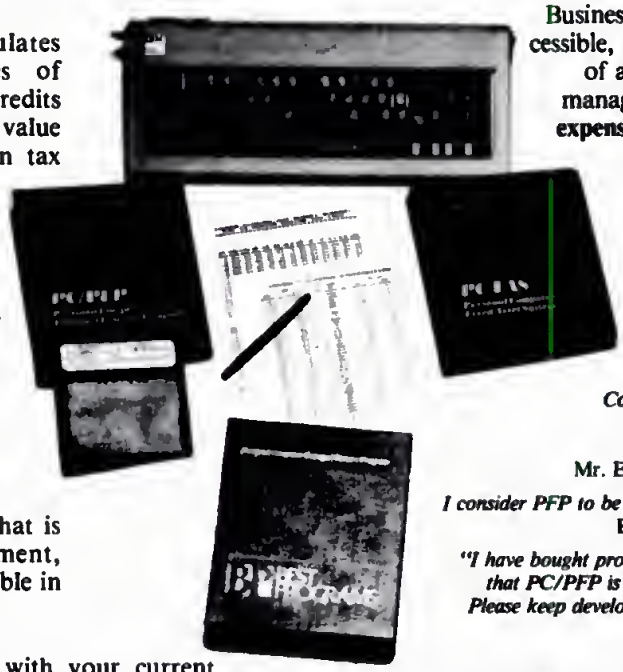
FIXED ASSET SYSTEM

PC/FAS is an easy-to-use record-keeping system that makes it simple for you to have complete and accurate records of your property and equipment for the IRS, state and local governments, insurance companies, and your business auditors.

PC/FAS automatically calculates ACRS and five other types of depreciation and investment tax credits needed for you to get the full value from new, lucrative depreciation tax laws.

Its wide selection of reports gives you complete management information on up to 99,999 owned or leased items of property or equipment in your office, plant, home or fleet. **PC/FAS** reports on each item by location, custodian, date, vendor, manufacturer, etc.

PC/FAS provides information that is essential for good management, required by the IRS, and invaluable in case of fire or theft.



PC/FAS is designed to fit in with your current system. It adjusts to any fiscal year, tracks unusual depreciation methods, and can keep two depreciation schedules for each asset.

Despite its power, **PC/FAS** is easy to use. It takes full advantage of the IBM-PC, uses all function keys, backward/forward tabbing, minimum key strokes for easy data entry. It gives you the quality and power that mainframe users expect. Its on-the-screen prompts assist you whenever you need help and its complete, easy-to-read manual meets our highest standards of quality.

Both **PC/FAS** and **PC/PFP** require DOS 1.0 and 1.1 with 64K RAM or DOS 2.0 with 128K RAM.

The Quality Software Company

BEST PROGRAMS

P.O. Box 2370, Alexandria, VA 22301 (703) 549-3663

PERSONAL FINANCE PROGRAM

PC/PFP is the **Best** cash management system for your business or home for only $95.00. This best-selling program is exciting because it shows you through a large choice of pre-formatted reports, bar graphs, and on-the-screen displays where your money comes from and where it goes. Businesses have found the precise, easily accessible, and complete summaries and reports of all receipts and income are invaluable management tools that can easily **(and less expensively)** be transformed by CPA's into tax reports, income statements, and balance sheets.

WE LOVE TO READ OUR MAIL... YOU WOULD TOO!

"Brilliant software! Why? Because it is simple Covers all needed uses. You deserve much credit as everything is so well planned out. Price is most attractive."
Mr. Erwin Jackson, Jr. Charlotte, North Carolina

I consider PFP to be one of the finest programs for the IBM PC."
Barry N. Parsley, M.D. Lexington, Kentucky

"I have bought programs since 1977 and I can unequivocably say that PC/PFP is the best buy for the money I have ever made. Please keep developing programs. The industry needs your high standards, and your reasonable prices."
Mr. James Gore Creskill, NJ

"The program works well and is easy to use. The newsletter is good and I must say the level of customer support couldn't be better."
Lorne Sheren, M.D. Staten Island, NY

"Your User Report is hot...support from software publishers is a welcome help."
Michael Truffer Deltona, Florida

HERE'S WHAT OUR REVIEWERS SAY:

"Best Product's PC/PFP is first class all the way. Any company looking to sell to the personal computer marketshould take Best's whole package as a model — this is the way it should be done. Best Programs offers a superior package in all respects. Best is best of this lot."
Carey Saudler **PC Magazine, Vol. 1, No. 10**

"Well-documented...program runs smoothly, and always presents clear, easy-to-understand prompts. Functionally, PC/PFP is complete. The program is well done and a good value."
Will Fastie **Creative Computing, January 1983**

"My overall impression of PC/PFP is a good one...suits the needs of a great number of people who want simple, straightforward help in their personal finances."
Cliff Smith, C.P.A. **Capital PC Users Group Monitor**

CIRCLE 147 ON READER SERVICE CARD

New On The Market

Property Management

A real estate manegement program that works with the PC with or without a hard disk.

The program performs all bookkeeping functions needed for residential or commercial property with as many as 1,000 renters or lease-holders, depending on hardware configuration. Financial records, including income and expense summaries, and individual tenent records can be generated.

By entering initial tenant records, the user can set up the PC to automatically post rental cherges to eech tenant's balance. The program will automatically record a complete history of all tenant charges, deposits, refunds, payments, and write-offs, maintaining current balances for all tenant accounts. *(List Price: $695)*

Requires: 128K, two disk drives, PC-DOS.

Continentol Softwore
11223 S. Hindry Ave.
Los Angeles, CA 90045
(213) 410-3977

CIRCLE 622 ON READER SERVICE CARD

T/Maker III

A software program that offers many of the features of both electronic spreadsheets and word processors. It can be used to generate meiling lists, sort records, create bar charts, build tables, edit text, and perform accounting functions. A reference manual is included. *(List Price: $275)*

Requires: 128K, two disk drives, PC-DOS.

T/Maker
2813 Flogmoker Dr.
Falls Church, VA 22042
(703) 532-3509

CIRCLE 663 ON READER SERVICE CARD

INFOTORY

A menu-driven inventory-management system, now available for the hard-disk drive. The hard-disk version of *INFOTORY* will eccommodate 25,000 inventory items. Retrieval time for any one item is about one second. The system retains its special features, including the Item Category Summary Report (which provides MTD and YTD sales and cost-of-sales information summarized by departments, product lines, or any other user-defined category) and *ANYREPORT* which allows inventory reports, price lists, and seles/cost analysis reports to be either scrolled on the video monitor or printed out, with report designs saved if desired to be recalled for future use. *(List Price: $575)*

Requires: 5M-byte disk drive with 96K, printer.

SSR Corp
1600 Lyell Ave.
Rochester, NY 14608
(718) 254-3200

CIRCLE 655 ON READER SERVICE CARD

TELEMATH

A set of math reinforcement software programs featuring arcade-style graphics to maintain student interest and stimulate student achievement. *TELEMATH* consists of 80 programs designed to reinforce 148 basic math objectives.

The 60 programs are available in a two-volume set, 40 programs in each volume. The programs contained in Volume 1 are also aveilable on ten separate disks, four programs to a disk. Because of their competitive nature, the 40 programs in Volume 2 require speciel *TELEMATH* paddles for student input. *(List Price: $40 for one disk; $350 for one volume.* TELEMATH poddles *list for $200)*

Requires: 64K, one disk drive, color graphics board.

Psychotechnics, Inc.
1900 Pickwick Ave.
Glenview, IL 60025
(312) 729-5850

CIRCLE 664 ON READER SERVICE CARD

DATA DESIGN

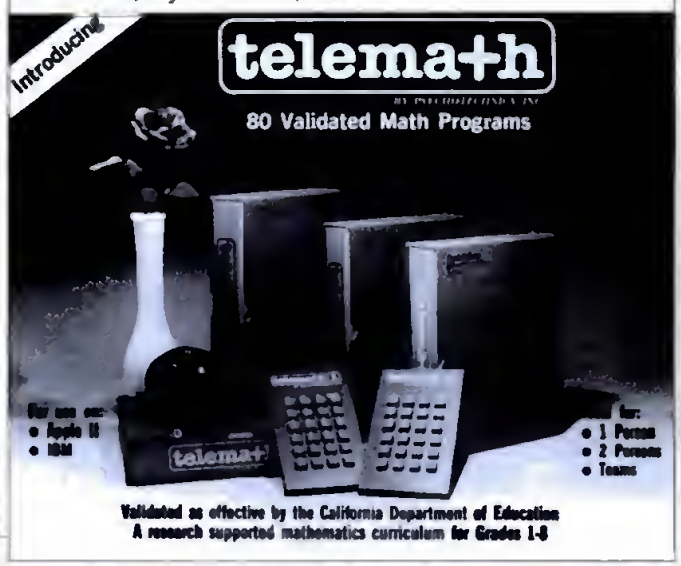
A menu-driven relational database management system that features help screens, 26 simultaneous indexes (sorted orders), multiple input/output forms, calculated fields with post option, internal backup, and a phone communication system. *(List Price: $225)*

Requires: 128K, two disk drives, PC-DOS. A printer is recommended.

Insoft, Inc.
10175 S.W. Borbur Blvd.
3202B
Portlond, OR 97219
(503) 244-4181

CIRCLE 662 ON READER SERVICE CARD

TELEMATH, Psychotechnics, Inc.



Accountant Series II

An expanded version of the Accountant series of integrated accounting software (G/L, A/R, A/P, Payroll). New features such as automatic service charges, mailing labels for customers and vendors, and compilable code for increased speed have been added. In addition, the manuals include startup and operational sections. *(List Price: $365)*
Requires: 64K, two disk drives, PC-DOS, 132-column parallel printer.
Insoft, Inc.
10175 S.W. Barbur Blvd.
#202B
Portland, OR 97219
(503) 244-4181

CIRCLE 661 ON READER SERVICE CARD

Payment Scheduler

An amortization schedule printing program designed to create special payment schedules for mortgages and other loans. The program will prepare a month-by-month schedule based on the desired payment, the principal balance, and the interest rate. *(List Price: $39.95)*
Requires: 64K, one disk drive, 80-column monochrome display, 80 cps Matrix printer, BASICA.
SimSoft, Inc.
1258 17th St.
Morysville, MI 48040
(313) 364-7241

CIRCLE 674 ON READER SERVICE CARD

V.I.P. Mailer

A mailing label system designed for the business user to keep track of important customers' names and addresses. This system allows additional customer information to be stored and printed.

Upon request, the program will print labels in standard size print font. Labels can be printed for only one customer or for as many as are stored on the master file. One time single labels can be defined and printed at any time and in any number. *(List Price: $34.95)*
Requires: 64K, one disk drive, 80-column monochrome display, 80 cps printer, BASICA.
Simsoft, Inc
1258 17th St.
Morysville, MI 48040
(313) 364-7241

CIRCLE 672 ON READER SERVICE CARD

GRADEBOOK 2.5

A disk program that allows teachers to store, retrieve, print, correct, and calculate grades and scores. The program stores up to 200 scores per disk (in any combination of class size). Grades can be weighed according to any formula that the user chooses. *(List Price: $36.95)*
Requires: 64K, one disk drive; printer optional.
MMCC Educational Software
4732 Fairview Ave.
Downers Grove, IL 60515
(312) 852-8640

CIRCLE 682 ON READER SERVICE CARD

DMS (Diskette Management System)

A menu-driven system designed to help the user keep track of disks. Each disk is assigned a volume serial number, beginning with 0001. This number is printed on the disk label and on the disk sleeve, and becomes the key to the master file of disks. Additional information, including disk description, disk location, creation date, and date when the disk may be used again, is also stored in a file.

The system also contains routines for adding new disks to the master file, updating information through a change routine, viewing disk information on the CRT screen, deleting a disk from the master file, printing a disk management report, and printing a disk-ready-for-reuse-report. *(List Price: $34.95)*
Requires: 64K, one disk drive, 80-column monochrome display, 80 cps Matrix printer, BASICA.
Simsoft, Inc.
1258 17th St.
Morysville, MI 48040
(313) 364-7241

CIRCLE 671 ON READER SERVICE CARD

Diet Analyzer

A program designed to help diet-conscious users monitor their daily food consumption for vitamin, mineral, calorie, fat, sodium, carbohydrate, and protein content.

Amounts of food consumed during the day are entered through program prompts. The foods are then analyzed against the information in the database and a printed report is prepared showing the nutritional value of the diet. *(List Price: $29.95)*
Requires: 64K, one disk drive, 80-column monochrome display, 80 cps Metrix printer, BASICA.
SimSoft, Inc.
1258 17th St.
Morysville, MI 48040
(313) 364-7241

CIRCLE 673 ON READER SERVICE CARD

New On The Market

Direct.Connect

A terminal and transfer program for communicating with other computers. This program captures data to a disk file or a printer and sends files to other computers.

Direct.Connect features over 25 different help screens, ALT keys, instant notification of communication errors, programmable function keys, and screen paging. It also allows the user to change communication and display parameters, and provides the option of using either the first or second serial interface. *(List Price: $145)*

Requires: One disk drive, 96K RAM, 80-column monitor, RS-232C serial interface.

Direct Aid
393-C South Broadway
Boulder, CO 80303
(303) 494-6265

CIRCLE 683 ON READER SERVICE CARD

BLOWUP

A printing program that allows users to print signs and/or notices in block characters one-inch high.

The package handles a set of 90 characters. Each program character prints in a 10-character by 10-line image on the printer. Users can copy and distribute the program without penalty. A copy of the program is available at no cost for users to try out. If pleased with the program, users should send $20 to the publisher. *(List Price: $20)*

Requires: 32K, BASIC.

Robert A. Murray and Associates
9110 31st Ave., N.W.
Seattle, WA 98117
(206) 783-9494

CIRCLE 620 ON READER SERVICE CARD

Programmer's Tool Kit

A set of structured BASIC business software development modules consisting of a Screen/Keyboard Manager and over 40 additional programming routines.

The Screen/Keyboard Manager is a generalized BASIC routine that can be merged into existing programs or used to write new programs. It performs all screen displays and keyboard input through programmer defined codes. Operator keyboard input errors are eliminated through data checking routines.

The forty-plus programming routines are designed to assist the BASIC programmer in structuring programs and performing similar functions at the same BASIC line numbers each time programs are developed. Using these routines, the programmer can choose the functions needed for each particular program. All routines interact with the Screen/Keyboard Manager. *(List Price: $49.95)*

Requires: 64K, one disk drive, 80-column monochrome display, 80 cps Matrix printer, BASICA.

SimSoft, Inc.
1256 17th St.
Marysville, MI 48040
(313) 364-7241

CIRCLE 669 ON READER SERVICE CARD

The Informer

A program designed to provide the user with disk directory information. It also allows for visual file name changes and enables the user to change file attributes for hiding and retrieving files.

The program uses a machine language routine linked with a BASIC program to gain access to the DOS disk directory. This routine reads and writes the directory and makes the physical changes to the file names and attributes.

Certain routines display all directory information either on the screen or on the printer. This information includes file name, file attributes, date created or last updated, the time of the last update, the file's starting side/track/sector location, and the file size. The program also shows the number of entries used, the number remaining, the total bytes used for files, and the number of bytes remaining for files. Operating system files are provided, as well as data files. *(List Price: $29.95)*

Requires: 64K, one disk drive, 80-column monochrome display, 80 cps Matrix printer, BASICA.

SimSoft, Inc.
1256 17th St.
Marysville, MI 48040
(313) 364-7241

CIRCLE 668 ON READER SERVICE CARD

The Depreciator

A menu-driven program that prepares depreciation schedules according to the Accelerated Cost Recovery System, a series of tax law changes that went into effect in 1981. This program has calculation and print routines for three, five, 10, and 15 year tangible property. Schedules are printed to illustrate monthly detail with totals shown for each year. The monthly depreciation expense amount and the accumulated depreciation are shown, as is the net book value. *(List Price: $39.95)*

Requires: 64K, one disk drive, 80-column monochrome display, 80 cps Matrix printer, BASICA.

SimSoft, Inc.
1256 17th St.
Marysville, MI 48040
(313) 364-7241

CIRCLE 670 ON READER SERVICE CARD

MICROMAGIC

With this program, users can downline load numeric and textual data to disk in VisiCalc format. Once the data has been downline loaded, it can be transferred onto the VisiCalc worksheet and manipulated with the standard VisiCalc commands. *(List Price: $150)*

Requires: 64K, one disk drive, IBM asynchronous communication disk.

f.P. Sharp Associates
2 First Canadian Pl. #1900
Toronto, Ontario
Canada M5X 1E3
(416) 364-5361

CIRCLE 665 ON READER SERVICE CARD

INTELLICOM

A menu-driven, intelligent communications software package that provides computer-to-computer communications from both terminal emulation and file transfer standpoints. Several file transfer protocols are supported, facilitating transmission of binary and ASCII data. Error detection and recovery schemes exist for those applications where data integrity is paramount.

Intellicom fully supports the protocols used by The Source and CompuServe.

Intellicom supercedes STERM, and the manufacturer offers current owners of STERM an upgrade to INTELLICOM for a minimal fee. *(List Price: $150)*

Requires: 64K, one disk drive, PC-DOS.

Computer Toolbox Inc.
1325 E. Main St.
Waterbury, CT 06705
(203) 754-4197

CIRCLE 667 ON READER SERVICE CARD

THE PROTECTOR

A disk copy protection system designed for use by software publishers and authors. The program can duplicate and copy-protect any type of DOS file, including interpretive BASIC programs. Each disk is serialized. The areas of the disk that hold DOS are unprotected so that the bootable system disk can be created by the end-user. One disk is capable of duplicating 1,250 disks. *(List Price: $250)*

Requires: 64K, two disk drives.

Logical Systems Corporation
Route 1, Box 253
St. Michael, MN 55376
(612) 497-3861

CIRCLE 681 ON READER SERVICE CARD

Investment-Master/PC

An investment portfolio management tool featuring record keeping and control for a portfolio of up to 2,000 different investments. It also provides reports of captial gains and dividend income and portfolio valuation, and handles multiple purchases of the same investment, certificate numbers, and ownership information. *(List Price: $199)*

Requires: 64K, 1 disk drive, 80 column monitor. Printer recommended.

Alro Computer Software Services
3100 E. High St.
P.O. Box 927
Jackson, Mi 49204
(517) 787-2204

CIRCLE 680 ON READER SERVICE CARD

Order Prospector

A menu-driven job-specific microcomputer software package designed to help sales managers increase sales productivity by providing prospecting data, encouraging sales followup, and reducing clerical work.

The program stores information on sales prospects, including customer name, product, potential order amount, probability of sale, and current status; and it develops a six-month projection of order volume. A summary report lists projected monthly volume for each territory. Current data is displayed for each territory reviewed and is revised instantly as conditions change. Up to 33 territories and 1,500 prospective orders can be stored on each data disk. *(List Price: $195; a demo disk is available for $25)*

Requires: 48K, one disk drive, 80-column continuous-feed printer.

MASCO
5963 Tulone St.
San Diego, CA 92122
(619) 453-8758

CIRCLE 685 ON READER SERVICE CARD

DATA ACE

A relational database management system that unleashes the power of mainframe systems to microcomputers using a block-structured Forth-based programming language, DML. The query language DIL provides full relational access to the database. The DDL mode allows dynamic definition and redefinition of the data dictionary.

A CATALOG mode facilitates entering of programs (DML), procedures (DIL), and text, and includes a full screen editor.

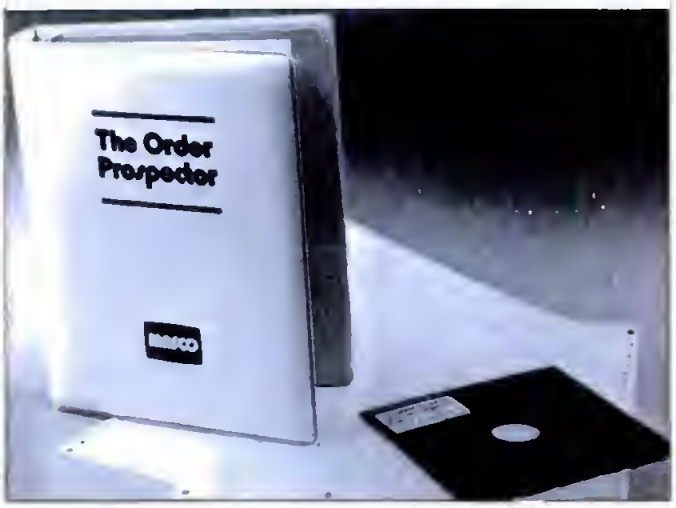
DATA ACE syntax is consistent in all modes. The communications interface is TRANSMIT and RECEIVE. *(List Price: $850)*

Requires: 64K, CP/M-86 or PC-DOS.

Computer Software Design, Inc.
1911 Wright Circle
Anaheim, CA 92806
(714) 634-9012

CIRCLE 666 ON READER SERVICE CARD

Order Prospector, MASCO



New On The Market

PLOT4

A menu-driven graphics program for generating custom color X-Y plots heving linear or logorithmic axes. Items on the menus include a main title, X and Y axis titles, line captions, a data column pair for eacb line, line types, axis limits, tick increments colors, and several other control flags and parameters. Piot data can be typed directly into coiumns displayed on the screen.

Up to nine lines can be included in the graph and each line can beve one of five different line types. Captions for up to four of the lines can be automatically displayed below the piot frame. A four-point interpolation option can be selected to smoothiy connect the data points. Lines are clipped at the frame borders.

Colors can be individually selected for almost every component of the graph, including the background color, colors for each iine, coiors for the titles, line captions, numeric axis iabeis, and the piot frame.

The user can save the menu contents and piot data on disk by using the *PLOT4* library maintenance commands. The completed graph can be saved on disk or transferred directly to an Epson or IBM printer with GRAFTRAX. *(List Price: $79.95)*

Requires: 64K, color/graphics adapter, 40-coiumn display, PC-DOS.

Carnegie Software
P.O. Box 1752
Redondo Beach, CA 90278
(213) 374-0550

CIRCLE 686 ON READER SERVICE CARD

Property Accounting System (PAS)

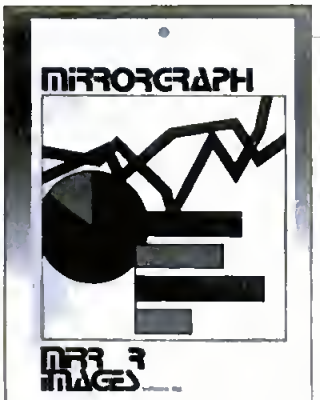
A menu-driven system that provides finenciel informetion on apartment properties. Property owners and managers can use this system to design their own chart of accounts and manage up to 30 properties with 50 to 2,500 units.

PAS features integrated payroll, automatic check printing, transection records, income statements, balance sbeets, monthly operating reports, quarterly peyroll reports, and monthly and year-to-date figures. It also includes an instruction manuel designed for novice computer users who are familiar with property management terms. *(List Price: $1,000)*

Requires: 192 to 256K, two disk drives, printer.

Freemon Systems
7 Sunset Lane
Menlo Pork, CA 94025
(415) 854-7399

CIRCLE 688 ON READER SERVICE CARD



MIRRORGRAPH, graphics progrom, Mirror Imoges Softwore, Inc.

MIRRORGRAPH

A menu-driven graphics system that enables the user to construct bar graphs, pie charts, and multiple line graphs from raw data. An optional monthiy axis allows the user to represent up to 13 months worth of dats on a single graph for the purposes of preparing annual reports and presenting yearly statistical data.

All graph-construction routines include a comprehensive audio/visual error-checking system. Once created, the graphs can be stored onto a disk or printed out on a dot-metrix printer. *(List Price: $59.95)*

Requires: 64K; printer required for hard copies, color monitor recommended.

Mirror Imoges Softwore, Inc.
1223 Peoples Ave.
Troy, NY 12180
(518) 274-2335

CIRCLE 687 ON READER SERVICE CARD

XF-DUMP

A general purpose utility program designed for programmers and experienced users who want to display and alter the contents of existing files. The program is capable of handling all known file structures and absolute sectors on a disk. All data is displayed in its character and in its bexidecimal representation.

When a record is displayed, any of the on-screen data can be eltered. To change e record, users key over the current data in either the character or hexidecimal fields. The change is then copied to the record in storage. When all changes are completed, they can be saved back to the disk to make them permanent.

Other program features are: full screen support, random and sequential file support, forward and backward paging, record selection by range, constant display of current track, sector, head and absolute sector for e file, and direct output to the display or printer. *(List Price: $35)*

Requires: 64K, two disk drives, 80-column display, PC-DOS.

Distributed Softwore Systems
P.O. Box 1301
Northbrook, IL 60062
(312) 634-1511

CIRCLE 635 ON READER SERVICE CARD

HOSTCOMM

by JANADON **$170.00**

The Complete Host Communications System

★Features:

- The first Host communications system for the IBM Personal Computer
- Run programs from a remote site with a terminal or another computer
- Use as a personal communications system or electronic mailbox
- Full Upload/Oownload facility for ASCII files
- Easy set-up, installation, and especially easy to use
- Full system operator support
- Three level password protection
- Unattended operation

ADD-ON FEATURES for HOSTCOMM

PCE-MAIL — designed to allow Hostcomm users to leave messages and correspondence for other users. Passwords permit privacy, "wildcard" addresses permit generalized mail. Help files provided. **$80.00**

CONFERENCING — make your Host the most popular system in town. Choose up to 12 different topics for your users. One menu can be used to control both PCE-MAIL and CONFERENCING. **$80.00**

HOST UTILITIES I — a series of 4 utilities for use with HOSTCOMM. MENU-MOD simplifies menu management. Other options compute file sizes and transmit times, list menus and filespecs. **$49.95**

HOST UTILITIES II — HOSTMENU permits alteration of a Download Menu, or changes to a higher number menu. HOSTFILE uses a password scheme so that only certain callers may download files. **$49.95**

ORDER TRANS — a program used with HOSTCOMM to provide callers with information about your products. Product descriptions are contained in a separate file for easy modification. Pertinent order information may be requested and stored from callers. **$39.95**

★Minimum Systems Requirements:

- 128KB System Unit
- 320KB Oiskette storage (1 or 2 drives)
- PC-DOS 1.0 or 1.1
- Printer
- Asynchronous Communications Adapter
- Hayes Stack™ Smartmodem 300 or 1200
- Video Oisplay (40 or 80 characters)

NF SYSTEMS, LTD.
P.O. Box 76363, Atlanta, GA 30358

IBM® Personal Computer

404-252-4146 — DATA 404-252-3302 — VOICE
Add $2.50 for postage and handling

VISA/MASTERCARD

Catalog Available

CIRCLE 344 ON READER SERVICE CARD

New On The Market

BANCWARE

A series of software modules designed for the banking community. This package calculates commercial and installment loans, and will print all necessary forms required for closing.

The user is prompted for all information necessary for payment and APR calculations. Once these have been made, the user is prompted for customer and collateral information.

Since the system saves the loan record on disk, all loan forms can be printed, changed and re-printed once or multiple times. *(List Price: $595)*
Requires: 64K, two disk drives, PC-DOS, printer.
MCS, Inc.
2715 E. 3300 South
Salt Lake City, UT 84109
(801) 486-8746

CIRCLE 690 ON READER SERVICE CARD

Financial Management Models

The programs consist of VisiCalc financial templates designed to assist the owner or manager of a service firm determine billing rates, monitor billable time, invoice clients, budget projects, and plan staff assignments.

The package also includes a 175-page manual in a three ring binder with written instructions. Each template is explained in detail and a glossary of financial terms is included. *(List Price: $295)*
Requires: 64K, one disk drive, printer, VisiCalc program.
Pro/Poc, Inc.
14925 Memoriol Dr., #105
Houston, TX 77079
(713) 498-1179

CIRCLE 689 ON READER SERVICE CARD

Finoncial Management Models, Pro/Pac, Inc.

Superfile System 3

A program that provides for updeting and automatic re-indexing of up to 85,000 records per data base. Each free format, variable length record can have up to 500 of the user's own key words as descriptors, with a maximum of 32,000 key words per data base.

Users can cross-index and retrieve records by linking up to 128 key words with "and," "or," and "not," and search up to 255 floppies or hard disks per data base.

The software prompts them to insert the correct disk before retrieval, with optional output to screen, printer, disk file or any combination of the three.

The program includes a second program from the manufacturer, *Post Hoste*. The *Post Hoste* program works with *Superfile* or Micropro's *Moil Merge* to allow users to format and print mailing labels, envelopes, membership lists, and other information. The *Post Hoste* program sorts information alphabetically or by zip code. *(List Price: $295)*
Requires: Two disk drives, or hard disk, DOS.
FYI, Inc.
P.O. Box 26481
Austin, TX 78755
(800) 531-5033
(512) 348-0133

CIRCLE 616 ON READER SERVICE CARD

Optimum-Sort

A general purpose sort/merge utility program that features the abillty to sort or merge files containing fixed or variable length records for a variety of dats types.

Up to five files can be sorted or merged at one time and nine control fields can be specified. File size is limited only by available disk space. The program is written in assembly language and uses a sorting algorithm. The program can be run from the keyboard or as a batch command. *(List Price: $75)*
Requires: 48K, ona disk driva. DOS.
Optimum Dato Processing
P.O. Box 2187
Humble, TX 77347
(713) 454-7428

CIRCLE 612 ON READER SERVICE CARD

Business Planner

A modeling program that provides a simulated modal of the user's busIness. By projecting monthly income and expense figures, budget allocations, and sales forecasts, users can analyze underlying assumptions in depth. Management decisions can be tested.

The program combines projects into alternative models to predict future growth. An illustrated manual is also provided. *(List Price: $395)*
Requires: 64K, two disk drives, IBM color monitor, or monitor equipped with IBM color graphics card, UCSD P-system.
Duosoft Corporation
1803 Woodfield Dr.
Sovoy, IL 81874
(217) 356-3111

CIRCLE 617 ON READER SERVICE CARD

QWIK-KEY, QWIK-GUIDE, QWIK-LABEL

Three separate accessories for use with the PC. QWIK-KEY is a plastic overlay card that fits around the PC's function keys. The card can be marked to indicate each key's usage for a particular program. The QWIK-GUIDE consists of a pair of plastic reference cards that contein all DOS commands, BASIC error messages and CONTROL/FUNCTION key information. The QWIK-LABEL is e set of 18 self-adhesive labels that identify the plug-in cards, knobs and connectors on the front and rear panels of the PC. Blank labels are also included. *(List Price: $4.50 QWIK-KEY, $3.25 for set of two QWIK-GUIDEs, $1 QWIK-LABEL, $7.75 complete set)*

Compu-Quote
6914 Berquist Ave.
Canoga Pork, CA 91307
(213) 348-3662

CIRCLE 638 ON READER SERVICE CARD

Model SL

A plug-in protector designed to clean incoming powerlines of overvoltage transients and spikes. The unit will plug directly into any grounded 110 volt outlet and accepts all standard, three-pronged plugs.

An instant reset provides continuous, uninterrupted protection. *(List Price: $99)*

Transtector Systems
E. 5250 Seltice Wy.
P.O. Box 1299
Post Folls, ID 83854
(800) 635-2537

CIRCLE 625 ON READER 5ERVICE CARD

CompuCovers

Custom-fitted, static-free computer dust covers available in tan or black cloth-backed vinyl and clear plastic. The covers are made to fit any size computer equipment. All covers are evaileble with the customer's own logo. *(List Price: $3.95 storting price)*

CompuCover
P.O. Box 324
Mory Esther, FL 32569
(800) 674-8391
(904) 243-5793

CIRCLE 634 ON READER 5ERVICE CARD

QWIK-KEY, QWIK-GUIDE, QWIK-LABEL, Compu-Quote

PC Transit Cose, Fiberbilt

HEAD Disk Drive Cleaning Kit

A cleaning kit that removes contaminating debris from the computer drive bead without removing or disassembling it and without abrasion. Eacb kit includes all of the necessary cleaning equipment with illustrated instructions. The cleaning solution comes with a controlled dropper tip dispenser. A limited five-year warranty is provided. *(List Price: $34.95)*

Coso Graphics
1401 Dorothy Dr.
Glendole, CA 91202
(213) 245-4355

CIRCLE 636 ON READER 5ERVICE CARD

PC Transit Case

Two light-weight transit cases composed of fibrex with beavy-duty aluminum frames, steel corners, and fully padded interiors.

Case #18314 holds the CPU and keyboard, while case #18315 bolds the IBM monitor and MX-80 printer. *(List Price: $161 case #18314, $171 cose #18315)*

Fiberbilt
601 W. 28th St.
New York, NY 10001
(800) 847-4176
(212) 675-5620

CIRCLE 643 ON READER SERVICE CARD

New On The Market

BANCWARE

A series of software modules designed for the banking community. This package calculates commercial and installment loans, and will print all necessary forms required for closing.

The user is prompted for all information necessary for payment and APR calculetions. Once these bave been made, the user is prompted for customer and collateral information.

Since the system saves the loan record on disk, all loan forms can be printed, changed and re-printed once or multiple times. *(List Price: $595)*
Requires: 64K, two disk drives, PC-DOS, printer.
MCS, Inc.
2715 E. 3300 South
Solt Lake City, UT 64109
(801) 486-6746

CIRCLE 690 ON READER SERVICE CARD

Financial Management Models

The programs conslst of *VisiCalc* financial templates designed to assist the owner or manager of a service firm determine billing rates, monitor billable time, invoice clients, budget projects, and plan staff assignments.

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Requires: 64K, one disk drive, printer, *VisiCalc* program.
Pro/Poc, Inc.
14925 Memoriol Dr., #105
Houston, TX 77079
(713) 496-1179

CIRCLE 689 ON READER SERVICE CARD

Finonciol Monogement Models, Pro/Poc, Inc.

Superfile System 3

A program that provides for updating and autometic re-indexing of up to 65,000 records per data base. Each free format, variable length record can have up to 500 of the user's own key words as descriptors, with a maximum of 32,000 key words per data base.

Users can cross-index and retrieve records by linking up to 128 key words with "and," "or," and "not," and search up to 255 floppies or hard disks per data base.

The software prompts them to lnsert the correct disk before retrieval, with optional output to screen, printer, disk file or any combination of the three.

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FYI, Inc.
P.O. Box 28481
Austin, TX 78755
(800) 531-5033
(512) 346-0133

CIRCLE 616 ON READER SERVICE CARD

Optimum-Sort

A general purpose sort/merge utility program that features the ability to sort or merge files containing fixed or variable length records for a variety of data types.

Up to five files can be sorted or merged at one time and nine control fields can be specified. File slze is limited only by availabla disk space. The program is written in assembly language and uses a sorting algorithm. The program can be run from the keyboard or as a batch command. *(List Price: $75)*
Requires: 46K, one disk drive. DOS.
Optimum Dato Processing
P.O. Box 2167
Humble, TX 77347
(713) 454-7428

CIRCLE 612 ON READER 5ERVICE CARD

Business Planner

A modeling program that provides a simulated modal of the user's business. By projecting monthly income and expense figures, budget allocations, and sales forecasts, users can analyze underlying assumptions in depth. Management decislons can be tested.

The program combines projects into alternative modals to predict future growth. An lllustrated manual ls also provided. *(List Price: $395)*
Requires: 64K, two disk drives, IBM color monitor, or monitor equipped with IBM color graphics card, UCSD P-system.
Duosoft Corporation
1803 Woodfield Dr.
Savoy, IL 61874
(217) 356-3111

CIRCLE 617 ON READER SERVICE CARD

QWIK-KEY, QWIK-GUIDE, QWIK-LABEL

Three separate accessories for use with the PC. QWIK-KEY is a plastic overlay card that fits around the PC's function keys. The card can be marked to indicate each key's usage for a particular program. The QWIK-GUIDE consists of a pair of plastic reference cards that contain all DOS commands, BASIC error messages and CONTROL/FUNCTION key information. The QWIK-LABEL is e set of 18 self-adhesive labels that identify the plug-in cards, knobs and connectors on the front and rear panels of the PC. Blank labels are also included. *(List Price: $4.50 QWIK-KEY, $3.25 for set of two QWIK-GUIDEs, $1 QWIK-LABEL, $7.75 complete set)*

Compu-Quote
8914 Berquist Ave.
Canoga Pork, CA 91307
(213) 348-3662

CIRCLE 638 ON READER 5ERVICE CARD

Model SL

A plug-in protector designed to clean incoming powerlines of overvoltage transients and spikes. The unit will plug directly into any grounded 110 volt outlet and accepts all standard, three-pronged plugs.

An instant reset provides continuous, uninterrupted protection. *(List Price: $99)*

Tronstector Systems
E. 5250 Seltice Wy.
P.O. Box 1299
Post Folls, ID 83854
(800) 635-2537

CIRCLE 625 ON READER 5ERVICE CARD

CompuCovers

Custom-fitted, static-free computer dust covers available in tan or black cloth-backed vinyl and clear plastic. The covers are made to fit any size computer equipment. All covers are availeble with the customer's own logo. *(List Price: $3.95 storting price)*

CompuCover
P.O. Box 324
Mory Esther, FL 32569
(800) 874-8391
(904) 243-5793

CIRCLE 634 ON READER 5ERVICE CARD

QWIK-KEY, QWIK-GUIDE, QWIK-LABEL, Compu-Quote

PC Transit Cose, Fiberbilt

HEAD Disk Drive Cleaning Kit

A cleaning kit that removes contaminating debris from the computer drive head without removing or disassembling it and without abrasion. Each kit includes all of the necessary cleaning equipment with illustrated instructions. The cleaning solution comes with e controlled dropper tip dispenser. A limited five-year warranty is provided. *(List Price: $34.95)*

Coso Grophics
1401 Dorothy Dr.
Glendole, CA 91202
(213) 245-4355

CIRCLE 636 ON READER 5ERVICE CARD

PC Transit Case

Two light-weight transit cases composed of fibrex with beavy-duty aluminum frames, steel corners, and fully padded interiors.

Case #18314 holds the CPU and keyboard, while case #18315 bolds the IBM monitor and MX-80 printer. *(List Price: $161 case #18314, $171 case #18315)*

Fiberbilt
601 W. 28th St.
New York, NY 10001
(800) 847-4176
(212) 675-5820

CIRCLE 643 ON READER SERVICE CARD

New On The Market

Glare/Reflection Reducing Filter

A micro non-filament fiber screen that mounts either externally or internally on an IBM monochrome display. The filter will reduce glare and reflection by up to 67%. It is available in five different densities of cloth, including two manufactured especially for color video displays. *(List Price: $65 for color terminals, $60 for non-color terminals)*

PROSOFT
P.O. Box 4391
Morion, CT 06444
(203) 621-9331

CIRCLE 627 ON READER SERVICE CARD

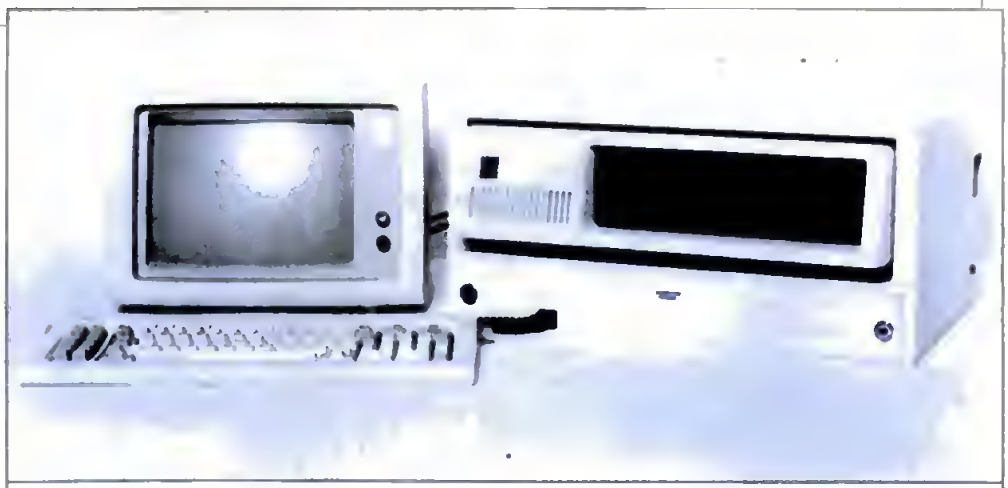
TOUCH-TILT

An ergonomically designed video pedestal thet ellows the PC monitor to be tilted or swiveled. The pedestal has e 15 degree tilt, and 360 degree rotation allowing two users to share the same monitor. Pedestsls come in three colors and range in size from 12×12 to 16×20. *(List Price: $59.95 to $69.95)*

Donnoy Technology
16669 Evergreen Circle
Fountoin Volley, CA 92706
(714) 839-4255

CIRCLE 637 ON READER SERVICE CARD

TOUCH-TILT, Donnoy Technology



The Computer Escort, *FMJ, Inc.*

Expansion Memory Boards

Memory boards which can be configured from 64K to 512K on 64K boundaries. Each comes with a card guide end a rear mounting bracket. Smaller memory boards can be field retrofitted to up to 256K. *(List Price: MEM84, $295; MEM128, $385; MEM192, $470; MEM258, $555; 64K exponsion for MEM64, MEM126, or MEM192 boards, $110)*

Moynord Electronics
P.O. Box 3322
Longwood, FL 32750
(305) 889-8058

CIRCLE 677 ON READER SERVICE CARD

The Computer Escort

A storage unit designed for the PC. The unit consists of a low profile bottom shelf unit which allows storage of the keyboard behind a locked door, a bottom removable adhesion plate to secure the unit to a table top, a removable adhesion plate for securing the computer, a removeble rear cover for storage of excess cables and accessories, and an optional Power Sentry which includes transient suppression with four AC outlets controlled by a key switch. Security brackets protect the plug-in cards inside the PC by restricting removal of the cover. Another option is a stacking shelf which is designed to bolt to the bottom shelf or can be set alongside for monitor, printer, or extra disk drives. *(List Price: $155)*

FMJ, Inc.
P.O. Box 5261
Torrance, CA 90510
(213) 325-1900

CIRCLE 676 ON READER SERVICE CARD

CTC Cable System

A component cable system that provides all parallel computer/printer interfaces. It includes e ceble section that conforms to the computer and a snap-on connector that adapts it for the specific printer. A printed circuit board in the connector can be used for absolute line skewing. *(List Price: $28 for 5-foot coble, $30 for 10-foot coble, $30 for connectors)*

CTC Electronics
Division of Communicotions Technology Corp.
2237 Colby Ave.
Los Angeles, CA 90064
(213) 477-4283

CIRCLE 659 ON READER SERVICE CARD

New On The Market

ACCESSORIES

Calc/Pad

A layout pad for electronic spreadsheet users. Each cardboard-backed pad conteins fifty 8½ × 11 sheets. The green-tinted paper is eresable end punched for three-ring binders. Space is provided for required text, veiues, or formulae. *(List Price: $4.75 + .90 shipping)*

Compu-Quote
6914 Berquist Ave.
Canogo Pork, CA 91307
(213) 348-3662

CIRCLE 626 ON READER SERVICE CARD

GRIDS

A software enhencement product to simplify the process of incorporeting graphic date in a word processor text file. The packege includes over 50 of the most commonly used greph peper formets with instructions on how to create hundreds more. *(List Price: $23)*

ATC Softwore
Rt. 2
Box 448
Estill Springs, TN 37330

CIRCLE 572 ON READER SERVICE CARD

How To Use WordStar

A series of three audio cassette lessons, requiring about two hours each, to teach the rudiments of the WordStor word processing system. The listeners learn to creete, edit, reorganize, merge, format, save, and print their own documents.

The course also includes a fully-indexed User's Guide thet summarizes all key idees end procedures from the lessons. With the need for reading end note-teking eliminated, the leerner is free to concentrate on the screen and keyboard, trying eech command and seeing the results.

The program provides for optional reinforcement at key points in eech lesson and works on any standard audio cessette pleyer—no computer hookup is required. *(List Price: $49.95)*

Requires: Same as WordStor.

Fliptrock Leorning Systems
A Division of Mosaic Medio, Inc.
526 N. Moin St., Box 711
Glen Ellyn, IL 60137
(312) 790-1117

CIRCLE 580 ON READER SERVICE CARD

Templates

Three templetes that fit on the PC's pencil ledge. The templetes contain command references for debug, EosyWriter, end WordStor. *(List Price: $8.99)*

E.T. Templotes
2921 Mishowoko Ave.
South Bend, IN 46615
(219) 234-0069

CIRCLE 564 ON READER SERVICE CARD

PC 4-PACK

A four-function memory expansion board with standard 64K-256K bytes of memory, an asynchronous RS 232C communications port, a real time clock/calendar, end a parallel printer port.

All memory chips are socketed and expandable in 64K increments up to 256K. Autometic parity insertion end verification is included. On-boerd DIP switches provide selective addressing on eny 64K rows.

The RS 232C communications port includes a standard DB 25-pin connector end is softwere programmeble for beud rate, word length and stop bits. Jumper selection ellows port to be addressed as COM1 or COM2. This adepter can elso be used for connecting any serial devices such as modems and RS 232C printers.

The real time clock/calendar includes a non-stop battery that runs even when the computer is off. The parallel printer port feature comes equipped with cable, standard Centronics connector and protocol. Jumper selection provides configuration of LPT1 or LPT2 without interfering with the operation of the standard perallel printer port on the monochrome board. *(List Price: $395)*

DATA Impoct Products, Inc.
745 Atlontic Ave.
Boston, MA 02111
(617)482-4214
Telex: 95-1047

CIRCLE 569 ON READER SERVICE CARD

COMPU-TABLE

A bome-use computer table to organize disk drives, monitor, printer, keyboard, and manuals into one space-saving area.

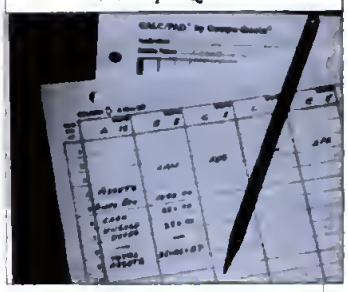
Constructed with steel tubular framing and woodgrain tops, the table features a built-in printer slot, built-in cord and ribbon slot for flush-to-wall fit and tangle-free wires. Its 27-inch height makes keyboarding comfortable.

Availeble options include a DATATOP shelf for storage of programs, manuals, disks, and printouts; a Disk Bay; a light that fits under the Date-top to provide a direct light source, end a metching printer stand. *(List Price: From $53.95)*

Compco Industries, Inc.
159 West Wolnut St.
Poinesville, Ohio 44077
(216) 354-4186

CIRCLE 584 ON READER SERVICE CARD

Colc/Pod, Compu-Quote



10 MByte Floppy

Resolves Storage Backup Dilemma

Now there is a proven, effective disk storage subsystem, the BC-20, for the IBM Personal Computer and S-100 based microcomputer systems

The **BC-20** is a 20 Megabyte high-performance disk storage subsystem, consisting of two 10 Megabyte removable cartridges. This subsystem is a direct access storage device that uses flexible media The media, a 10 Megabyte cartridge, is an efficient, durable polycarbonate enclosure containing a single flexible disk, internally latched to prevent user contact This cartridge is easy to use, and can be safely transported in its own packaging

The BC-20 is the simple solution to your disk storage backup dilemma.

Write or call for more information

BC SYSTEMS INC.
1016 East 31st Street
LaGrange Park, Illinois 60525
(312) 579-0672

Please send me more information on the BC-20 Disk Storage Subsystem

Name _____

Address _____

_____

Telephone _____

BC SYSTEMS INC.
1016 East 31st Street
LaGrange Park, Illinois 60525
(312) 579-0672

CIRCLE 175 ON READER SERVICE CARD

EDITED BY SUSAN HURLEY

Clubs, bulletin boards, and newsletters enable PC users to capitalize on their fellow users' knowledge.

Club News

PC User Groups

This list provides the names and addresses of PC User Groups worldwide. You can check this list to locate other PC aficionados in your area.

ALABAMA

Birmingham User Group
Chet Ellis
ComputerLand
215 W. Valley Ave.
Birmingham, AL 35209
(205) 942-8085

ALASKA

Anchorage User Group
Mark Bolzern
c/o General Computer Services
213 W. Sixth Ave. #11
Anchorage, AK 99501

ARIZONA

The Phoenix IBM PC Users Group
Fred Linch
P.O. Box 44218
Phoenix, AZ 80564
(602) 954-7519

IBM PC Idea Exchange
Lisa May
United Systems Corporation
1074 E. Sandpiper Dr.
Tempe, AZ 84283
(602) 831-9363

IBM PC User Group
Theresa Baudier
P.O. Box 1489
Tucson, AZ 85701
(602) 622-4751

CALIFORNIA

Sacramento IBM PC Users' Group
2844 Wright St., #135
Sacramento, CA 95825

San Diego IBM User Group
Michele Albright
4005 Isle Dr.
Carlsbad, CA 92008
(714) 434-1608

San Diego Computer Society
John Field
1384 Caliente Loop
Chula Vista, CA 92010
(714) 421-9686

IBM PC User Group
Lee Wersel
7255 Orchard Dr.
Gilroy, CA 95020

Beach Cities IBM PC Users Group
Phil Root
6242 Moonfield Dr.
Huntington Beach, CA 92648
(714) 847-6369

Modesto-Turlock PC User Group
Liz Leedom
Box 1122
Modesto, CA 95353
(209) 523-4218, 578-2358

IBM Users Group of California
Neil Zachary
P.O. Box 4136
Los Angeles, CA 90028
(213) 937-1314

PC will publish a periodic listing of PC user groups and their activities. Drop a line to Club News, PC, One Park Ave., New York, NY 10016.

Businasa Computer
Usars Group
David Nussbaum
c/o Software Central
650 E. Colorado Blvd.
Pasadena, CA 91101

Diablo Vallay PC
Alfred Hunt
P.O. Box 23764
Pleasant Hill, CA 94S23
(415) 687-8037

Advanturers Anonymous
Michaal Eddy
P.O. Box 8286
Rancho Santa Fa, CA 92067

Cubic Computer Club
Pata Nalson
P.O. Box 80787
San Diego, CA 92138
(714) 4S3-49S3

Sen Francisco IBM PC User Group
Alfrad Goodwin
Software Centar
4720 Geary St.
San Francisco, CA 94118
(415) 7S1-2231

U.C. San Francisco Usar Group
Bruca Stagnar
UCSF U-76
San Francisco, CA 94143
(415) 666-1409

PC Club
Max Brioski
1880 California St. #12
San Francisco, CA 94109
(41S) 77S-8882

Pomona Vallay IBM-PC User Group
Roy Livingston
10282 Falipe St.
Montclair, CA 91763
(714) 624-9194

Bay Area User Group
Christian Du Lac
P.O. Box 1SS
San Francisco, CA 94101
(41S) 668-4647

Santa Barbara City College Computer
Science Department
Stu Swartz
721 Cliff Dr.
Santa Barbara, CA 93109
(805) 966-2919

Silicoo Vallay Computer Club
Peter Harris
510 Lawrence Expressway
P.O. Box 686
Sunnyvale, CA 94086
(408) 248-90S7

San Fernando IBM PC Users Group
David Nussbaum
11SS8 Riverside Dr. #207
North Hollywood, CA 91602

Peninsular IBM PC Users Group
c/o Friandly Software Corp.
376 El Camino Real
San Carlos, CA 94070

Greater South Bay IBM PC Users Group
P.O. Box 66S
Lomita, CA 90717
(213) 32S-7533

Thousand Oaks Personal Computer Club
(TOPCC)
c/o ComputerLand
171 E. Thousand Oaks Blvd.
Thousand Oaks, CA 91380

COLORADO

Danver Usar Group
Steva Leibson
4040 Greenbriar Blvd.
Boulder, CO 80303
(303) 494-4062

PC Usars Group
Clevalaod L. Ball
17665 Shahara Rd.
Monumeot, Colorado 80312
(303) 488-3049

CONNECTICUT

IBM Personal Computer User Club of
Stamford
Dava Foulger
69 River St.
New Caanan, CT 06840
(203) 966-9378

IBM PC Club
Colette B. Squires
P.O. Box S4S
Storrs, CT 06268

Central Connecticut User Group
Rich Paterson
ComputerLand
131 S. Main St.
Wast Hartford, CT 06110
(203) S61-1446

The best thing about being at the top is that I can spend all my time playing Executive Suite™ from Gray Flannel Fun.™

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Executive Suite is a Gray Flannel Fun game from Armonk Corporation. It runs on the IBM® Personal Computer.

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ARMONK CORPORATION

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Newport Beach, California 92660
(714) 760-3955

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CIRCLE 126 ON READER SERVICE CARD

I·B MAGAZETTE

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Magazine on Diskette

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National User's Group

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Recreational, Educational, Easy to Use New Idea

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Fun

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CIRCLE 268 ON READER SERVICE CARD

DISTRICT OF COLUMBIA

IBMICRO
Mike Todd
1414-C Wright Cir.
Bolling AFB
Washington, DC 20336
(202) 433-4380

FLORIDA

IBM Personal Computer Users' Group
Wyatt Bell
The College of Boca Raton
3601 N. Military Trail
Boca Raton, FL 33431

GEORGIA

Atlanta IBM PC SIG
6700 23-B Roswell Rd.
Atlanta, GA 30326

HAWAII

Honolulu IBM PC Users Group
Doug Long
P.O. Box 22967
Honolulu, HI 96822

IDAHO

Idaho PC User Group
Bruce Burns
ComputerLand
687 S. Capitol Blvd.
Boise, ID 83702
(208) 344-5545

ILLINOIS

Autumn Chapter User Group
James L. Szafranski
5195 Castaway Ln.
Barrington, IL 60010
(312) 934-8133

INDIANA

ComputerLand User Group
Susan Shields
ComputerLand
5450 N. Coldwater Rd.
Fort Wayne, IN 46825
(317) 259-7892

IBM PC Users Group, Inc.
P.O. Box 68271
Indianapolis, IN 46268

Northern Indiana IBM PC Users Group
Dr. Terry Alley
316 N. Ironwood Dr.
South Bend, IN 46615
(219) 269-5506

IBM PC User Club
Jo Spangler
Microbase Software, Inc.
P.O. Box 40353
Indianapolis, IN 46240
(317) 877-4304

South Bend PC Club
Thomas R. Lafree
19525 Cleveland Rd.
South Bend, IN 46637
(219) 277-3344

IOWA

Cedar Falls User Group
Lee Ann Moore
Black Hawk Village Shopping Center
Cedar Falls, IA 50613

IBM PC Users Group
P.O. Box 248
Des Moines, IA 50301
Attn: Gary Wilcox
(515) 967-5880

KANSAS

Topeka Library User Group
Becky Hinton
Topeka Public Library
515 W. 10th St.
Topeka, KS 66604

KENTUCKY

Louisville Users Group
Clyde Jenkins
Capitol Holding Corporation
660 Fourth Ave.
Louisville, KY 40202
(502) 584-6157

LOUISIANA

New Orleans Personal Computer Club
3517 19th St.
Metairie, LA 70002

MARYLAND

I/O News
c/o Data Unlimited
9 Congressional Ct.
Baltimore, MD 21220

Lutherville User Group
Bob Roswell
1516 York Rd.
Lutherville, MD 21093
(301) 337-5555

Baltimore IBM PC Users Group
1910 Trout Farm Rd.
Jarrettsville, MD 21064

MASSACHUSETTS

MMS-Forth
Miller Microcomputer Services
61 Lake Shore Rd.
Natick, MA 01760
(617) 653-6136

IBM PC Users Group
The Boston Computer Society
3 Center Plaza
Boston, MA 02108
(617) 367-8080

Massachusetts IBM PC Users Group
Robert L. Ward
P.O. Box 1014
Heritage Sq.
Belchertown, MA 01007

MINNESOTA

Minneapolis User Group
Peter LeNeau
100 N. 6th St.
Minneapolis MN 55403
(612) 339-3233

MISSOURI

Columbia PC Users Group
Jennifer DuPont
5571 E. Rocky Mountain Ave.
Columbia, MO 65201
(314) 474-1773

NEW JERSEY

Personne Computer Associetion, Inc. The
Int'l Association for Users of the PC
Larry Collison
P.O. Box 759
Point Pleesant, NJ 06742
(201) 840-0300

North Jersey IBM PC Club
Irving Lang
7 West 45th St.
New York, NY 10036

NEW YORK

QNPC
Nathan Chao
Dept. of Computer Technology
Queensborough Community College
Bayside, NY 11364
(212) 631-6207

East Coast Club
Richard Parker
ComputerLand
79 Westbury Ave.
Carle Place, NY 11514
(516) 742-2262

NYPC: The NY IBM Personal Computer
Users Group
Joe Rigo
1365 York Ave.
New York, NY 10021
(212) 249-6418

The Manhattan IBM Micro Club
Helaine Head
360 Centrel Park West
New York, NY 10025
(212) 222-9027

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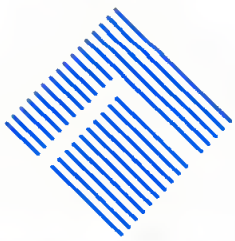

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RaadiWriter supports **proportional** spacing, **superscripts** and **subscripts.** It **centers, right aligns, underscores** and **boldfaces** text.

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InterBank #_____or Check or M.O.

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Name_____

Addrass_____

City_____

State, Zip_____

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CIRCLE 387 ON READER SERVICE CARD

IBM PC Users Group of the New York Amateur Computer Club, inc.
Jim Creane
P.O. Box 106, Church St. Station
New York, NY 10006
(212) 260-6811

The Long Island Computer Assoc.
Marvin Freifeid
3 Lyndron Ave.
Smithtown, NY 11787
(516) 724-0574

Picture City Personal Computer Programming Club
Dale Dewey
7284 High View Trail
Victor, NY 14564
(716) 924-5585

OHIO

Ohio IBM Club
Dr. Robert Bergholz
9529 Heather Ct.
Cincinnati, OH 45242
(513) 243-9298

Acorn IBM-PC Users Group
Jerry Daiker
P.O. Box 3097
Cincinnati, OH 45201
(513) 741-8279

Western Reserve IBM PC Association
Larry Gavin
ComputerLand
2000 North Road SE
Warren, OH 44484

IBM-PC Users Club
Chuck Harrington
315 Cutler Hall
Ohio University
Athens, OH 45701
(614) 594-6125

Greater Cleveland PC Users Group
Roy McCartney
30704 Royalview Dr.
Willowich, OH 44094
(216) 944-5173

OKLAHOMA

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Dan Perry
P.O. Box 55329
Tulsa, OK 74155
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OREGON

Portland IBM Portland Computer Club Newsletter
Rich Rohde
12260 S. W. 124th St.
Tigard, OR 97223
(503) 620-6862

PC Users Group
Greg Estes
P.O. Box 5070
Eugene, OR 97405

PENNSYLVANIA

International Personal Computer Owners
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CIRCLE 570 ON READER SERVICE CARD

PC-DOS provides a collection of utilities to handle such procedures as batch processing, disk formatting and copying, date stamping, and file handling. Users often find, however, that they need to perform other similar operations that are not supported by IBM's operating system. In the past few months, there has been an explosion of new software to take up the slack.

Cortland's PC-System *Utility Pak* touts one of its modules as a program that "may be the most valuable addition to your software library." Well, not quite. The package does contain a bit copier to make backup copies, an alphabetical DOS directory, a print spooler, a program lister, and a program to switch back and forth from color to monochrome monitors. But if this is the best software in your library, you must only be using your PC to hold down papers so they don't blow off your desk.

Two for the Money

For $79.95, you get one standard issue zip-lock plastic bag, one folded gray cardboard table of contents, two slightly different six-page Instruction booklets, and one scrap of paper containing a correction. Why two instruction booklets? Good question. One version says that the print spooler will work with only the IBM printer. The other claims it will work with "most printers." One booklet comes with little pictures. The other does not. One mentions that entering a name incorrectly will crash the system. The other relies on a sliver of loose paper to tell you this. Perhaps one booklet is version 1.1 of the manual. If so, why include both?

IF YOUR listings are crying out to have the day of the week printed on them, grab this program.

The copying module is very much like the one sold by Norell Data Systems. If you can't sleep at night because you're afraid a freak magnetic storm will pass through your office and turn all your copy-protected disks into frisbees, this can help. Although it will make backups of some software that confounds the DOS diskcopy command, it is stymied just as easily by clever copy-locking schemes.

Better Arrangements

The directory organizer claims to be "much more powerful and user-friendly" than its DOS counterpart. The only real difference is that the DOS directory isn't alphabetized and hugs the left edge of your screen. If your disk contains more than 25 files, DOS will scroll some off the top of the screen as it displays new ones at the bottom. Cortland's directory, on the other hand, displays your files in two fat columns, allowing you to cram twice as many files onscreen at once. Although this is handy, a Freeware directory utility called SDIR not only sorts in the Cortland

fashion, but arranges your files by extension, dete, or size, end includes eny files hidden on your disk.

Wrap-Around

The print formetting module reminds me of the useless smell eppliences, like blenders with heaters in them, thet people give as wedding presents to young couples they don't know. The formetter tekes e perfectly good progrem listing, puts e second set of consecutive numbers in front of line numbers thet ere alreedy there, then centers the whole works on the pege. If you have lines that just barely fill a stendard 80-column screen, this program will wrep the lest few letters of each onto the next printed line, which looks terrible. And while it cleims to print out text files, it messecred severel of mine. To its credit, PC-System Utility Pok breeks the listings at the pege perforation. It also stemps eech page with the neme, page number, dete, end dey of the week. If your program listings are crying out to heve the dey of the week printed on them, grab this program. An improved version is also being offered elsewhere as e Freeware program.

Coincidence?

The print spooler works fairly well, except thet when it's loaded, the print head jumps spasmodically across the page end back from time to time, leeving little rows of eitches in its wake. To load the spooler, insteed of entering SPOOLER, PS, or SP, you have to type in SM-N14. Type in that cryptic commend incorrectly and the system hengs. In eddition, the instruction book properly advises you how to add this program to an AUTOEXEC.BAT file. Funny thing—a variation has been aveileble for months as e Freeware progrem. Do these coincidences seem odd to enyone else?

CORTLAND'S directory displays your files in two fat columns, allowing you to cram twice as many files onscreen at once.

The fifth progrem on the disk lets you zip back and forth between color and monochrome monitors. It is not being distributed elsewhere as e Freewere program; insteed, IBM is giving it ewey—as in *free*. The freebie version we use around the office works in both DOS end BASIC, the Cortlend version works only in DOS.

True, the four modules in this peckage are useful. But they are no better than other programs on the market, and in severel cases, they are plagued with unfriendly or incomplete features. If you want to shop around and hunt down the superior verslons, you'd be better off. If you prefer the convenience of having them all in one plece, however, you might want to consider giving this a try. Still, $80 is e lot for second-cless softwere, and this peckage isn't going to make it into the disk Hall of Feme. */PC*

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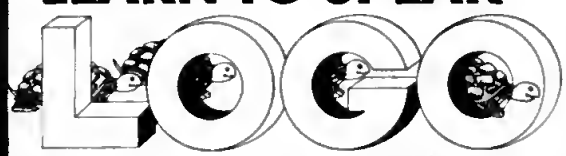

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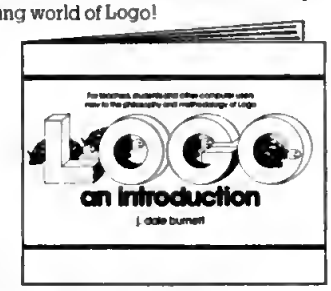

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CIRCLE 373 ON READER SERVICE CARD

EDITED BY COREY SANDLER

Insights, tips, and occasional bugs, as reported by the PC-user community.

User-To-User

This month's contributions from users feature good old American (and Canadian) ingenuity. You'll read about ways to help you remember the name of your current VisiCalc file and ways to help your computer remember a picture. You'll find out how to give your printer a cheap pair of legs and your PC an inexpensive diskless memory. But first, a little device from a BASIC programmer who wanted to keep his listings in order.

An Adjustable Feast

Here is a technique I have found useful when developing long BASIC programs. It is irritating trying to keep track of the starting line number of each module or subroutine in order to list it for viewing or modification. It's especially rough when frequent renumbering is made necessary by adding lines within each module.

The solution I found has been to write a self-adjusting, executable index at the start of the program, like this listing (see Figure 1):

Now, when I want to view any subroutine, I just enter List -200. I look at the line number of an indexed subroutine (say, line 190 for the Text Bordering subroutine) and then enter RUN 190 to get an instant listing of the module on the screen. The beauty of this process is that the listing numbers change automatically to keep track of the modules and subroutines during the Renum process. Finally, after the BASIC program is fully developed, this module index can be deleted.

Bob Baillie
Montreal, Quebec, Canada

An Audio Fan

Since most PCs are sold with disk drives, the cassette recorder interface has become something of an orphan. There is very little software, if any, to run with it, and documentation is scarce. The IBM Technical Reference Manual leaves you staring at a picture of a 5-pin DIN connector and that's it.

And to make things worse, IBM does not sell a cassette recorder or even a cable that will interface to one. The local IBM dealers were not the least bit helpful to me, either. Here is what I found by myself:

The cable you need may be purchased

Figure 1: Sample of a self-adjusting executable index, written by Bob Baillie.

```
10 GOTO 210
20 CLS: LIST 600-800    : STOP REM EXECUTIVE
30 CLS: LIST 770-970    : STOP REM OPTION 1, ENTRY MODE
40 CLS: LIST 980-1180   : STOP REM OPTION 2, SORT & DISPLAY
50 CLS: LIST 1190-1270  : STOP REM OPTION 3, HARD COPY
60 CLS: LIST 1280-1480  : STOP REM OPTION 4, MAIN PROG MENU

190 CLS: LIST 3000-3200: STOP REM TEXT BORDERING SUBROUTINE
200 CLS: LIST 3400-3600: STOP REM CLEAR COLUMN SUBROUTINE
210 REM START OF PROGRAM
```


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from Radio Sback. It's called tha Radio Shack Color Computer–Audio Cassatte Intarfaca. This cable has tha correct connector for the PC and three plugs for the cassette recordar. It retails for $5.95. Thare is a plug for input, a plug for output, and a smallar plug for motor control. You can get by without using motor control, but you will have to start and stop tha macbine manually and not from the keyboard.

IBM DOES NOT sell a cassette recorder or even a cable that will interface to one.

Larger tape decks can also be usad, but tha cabla will probably need diffarent adaptars to handle biggar plugs.

Ona usaful feature is a tape countar to kaap track of whare your programs and data are stored on a cassetta. Any tapa can be used, but leaderless tapes (also availabla from Radio Sback) are a convanience. If you try to record over the laadar of a tape, your PC will not know the difference. You will, though, wben you find you cannot retriave tha data. Ba sure to depress the Record and Play buttons whan you sava data and programs on tapa, just as you would in making an audio recording.

I have found the PC works best with as strong a signal as possible from tha tape—always record with tha volume on bigh.

If you want to write-protect a cassette, you can remove tha two small tabs on the back (away from tha opaning) of the cartridga. If you changa your mind latar, you can cover the openings with a piece of tapa and record again with tha sama cassatte.

To test your cassatta recordar, you can usa the tapa varsion of IBM's diagnostics, available with the PC's Guide to Operations.

Sevaral Readars

A Cheap Stand

Purchase 12 inches of ⅜-inch diametar woodan dowling and four rubber feet to fit the dowling. Cut tha dowling into four aqual piaces and attach a rubber foot to aach. The othar end of the dowling piecas will than fit nicely into the recassad screw holes at the undersIda corners of tha IBM Parsonal Computer Printar.

Additional haight can be gained by increasing the langth of the lags. If you taka advantage of this, be careful you do not give up too much stability.

Richard O. Kilmar
San Antonio, Taxas

Sounds lika o plotform wa could run on. Thosa legs should work on the Epson ond other similor lightweight printers, too, I imogine.

A Visible Reminder

I hava discovared a vary simpla techniqua to use with *VisiCalc* that has saved ma considerabla confusion. My discovery was inspired by losing several bours of work on a large worksbeet when I accidentally wrota ovar an existing worksbeet with a naw one. Tba accident happenad becausa I had forgottan the name of the worksheet I was working on.

Now I have a way to prevent this. At tha top of every workshaat In location A1, I place the nama of the worksheet itself. In location B1, I write the date of the last updata.

Whan I'm ready to save a worksheet aftar updating it, I first mova the cursor to tha top laft corner of the screan by pressIng the Home key. I then enter /SS. At this stage I can scroll through tha names of the files on the disk by repeatedly pressing the --> key combination. I continue scrolling through the fila namas until ona appears in tha VisiCalc edit line that matches the nama I stored at location A1. Since botb namas are visible on the screen, there is only a small chanca of writing ovar tha

LISTING numbers change automatically to keep track of modules and subroutines.

wrong worksheet by mistake. When the names match, I press the Enter key to save the updated version.

This convention is also useful when I need a printout of a worksheet. When the worksheet is printed, the first thing I see is its name and date of creation, a handy reminder. Of course, I can eliminate this information before it appears in the final version of a report by using the VisiCalc printing controls.

SINCE BOTH names are visible there is only a small chance of writing over the wrong worksheet.

Phil Mader
Wichita, Kansas

Perfect Recall

The following is a short program I wrote to save any pattern or display to disk for later recall:

```
10 REM Scrnsave screen dump
20 DEF SEG=&HB800:Input A$
30 BSAVE A$,0,&H4000
```

And then this program will retrieve it from disk at a later time:

```
10 REM Before running, enter screen
11 REM status, as in Screen 1,0
12 REM Enter colors, as in Color 13,1
20 Input "Filename:",a$:CLS
30 DEF SEG=&HB800:BLOAD A$
```

Both these programs can be incorporated into others as routines for dumping and retrieving screens.

Mike Slessor
Whonnock, British Columbia, Canada

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A perennial from IBM keeps on blooming, a quick look at EEPROMS, and a comment on burgeoning interest abroad in computer education.

The View From Here (And From Tasmania)

IBM has been much in the news letely, which should not be surprising for the largest computer manufecturer in the world. However, some of the news items are eyebrow raisers.

Typewriters Not Dead Yet

As e reeder of PC, you "know" thet the world is beeting a path to the PC (and other personel computers). Even compenies that cennot justify the purchese of e PC ere switching to electronic typewriters if we can believe the eds of Xerox, Brother, end Olympia. Well, their claims just mey not be true.

A recent erticle in The Woll Street Journal pointed out thet the 22-year-old IBM Selectric typewriter hed en enormously successful seles yeer in 1982, with roughly 450,000 units sold compered to sales of around 260,000 units of ell electronic typewriters combined.

As the article noted, "Thet flies in the face of optimistic forecasts made for the computerized electronic typewriters ever since their debut in 1978. The intelligent typewriters promised to become crucial to the 'office of the future' by making secreteriel typing chores eesier, fester, and cheeper."

Although the switch to electronic mechines is accelereting, with eight million Selectrics in use, IBM gives every sign thet it expects to sell millions more of its electric mechine.

Hence, it is epparent thet the PC is not replecing existing office equipment, but is finding its wey onto desks that heve never held e typewriter before—end finding its wey in huge numbers! Whet is IBM's reection to ell of this? Tight-lipped, of course, but we can gleen some intelligence by observing closely what is heppening emong IBM suppliers.

THE EEPROM can be erased and reprogrammed up to 10,000 times with just a small burst of electricity.

New High End IBM PC?

Although, the much-rumored low-end PC, dubbed the "Peenut," eppears likely to make a debut before the end of the yeer, suppliers see some interesting activity at the high end (of the personal computer spectrum).

IBM is expected to introduce an upgraded version of the PC built around an 8086 or 186 mpu, both of which have a true 16-bit interface. It is also expected thet IBM will include as much as 256K of memory in the basic machine. As a result, many edd-on makers are shifting emphasis to high-capacity storage products and to multi-function boards compatible with the new 16-bit mpu end essoclated revision of MS-DOS.

Davong, for exemple, has a combination edd-on board for the IBM PC that will include networking capabilities, a real-time clock, RS-232 ports and a parallel port. AST hes e similar board in the works as well es 16-bit versions of its current 8-bit offerings. Quces is elso redesigning its current Big Blue, which offers a Z80 CP/M card; celendar clock; 84K RAM; and serial, parellel, and hard disk interfaces.

In the aree of mass storege, Arnold Geller of Quces says the company will be emphesizing herd disk subsystems of 20 megabytes end up. Vista and TecMar also expect to put increased emphasis on high capacity memory devices.

More immedietely, Martin Alpert, president of TecMar says his firm will

soon introduce a backup drive for the fixed disk drive that IBM unveiled in March.

ROMs, PROMs, and EEPROMs

While on the subject of memory, here's a news note about a new type of memory that probably won't be in the next version of the PC, but that you might meet in your next trip to the supermarket. It's called an EEPROM. First, a bit of history. Nonvolatile memory chips have programs and data permanently stored in the chip and are called read only memories (ROM) because they can only be read and not altared. Producing a ROM chip is a costly operation since a mask must be made and the chip manufactured in quantity to justify the development cost.

Several years later, chip makers found a way to make a blank ROM chip that could be programmed the first time it was put into an active circuit. This was called, appropriately enough, a PROM, or programmable ROM. Once programmed, it could not be erased or raused.

Tha next advance was an EPROM, or Erasable PROM. This chip cannot be erased in normal use, but it can be removed from the circuit and exposed to ultraviolet light for about 15 minutes to blank out the contents. it is then ready for reprogramming.

I SAW huge banners everywhere urging workers to become computer literate.

Now, Intel has announced an EEPROM, which means Electrically Erasable Programmable Read Only Memory. The EEPROM can be erased and reprogrammed up to 10,000 times with just a small burst of electricity. According to Don Knowlton, an Intel product manager, "The EEPROM is ideal for prices and look-up tables that have to be updated frequently."

Moreover, an EEPROM can be reprogrammed from information transmittad by talaphona or aven radio. it is ideal for changing prices and codas in electronic scanning cash registers. The military already uses EEPROMs in air-to-air missiles to distinguish friendly from enemy aircraft. Oldar chips had to be replaced as new aircraft that were not in the memory went into servica; the new chip can be quickly reprogrammed to deal with new planes.

And Elsewhere

A recent article in the London Times noted that Britain is the first country to hava provided almost avary secondary school in the country with a microcomputar. During the past 18 months, over 5,800 schools took advantage of the government's "Micros in Schools" program. According to Kenneth Baker, industry Minister of State, "Every secondary school now has some computer facility and we are the first country in the world to achieve this."

The Far East is notable for producing great numbers of electronic products at low cost, but outside of Japan, computer literacy is not widespread. On a recent trip to Singapore, however, i noted that the Singaporeans, at least, are trying to change that.

While walking around Jurong, an industrial manufacturing center, i saw huge banners everywhere urging workars to become computer literate. Free courses were offarad at the Workers' Center, a kind of union.

My trip also took me to Tasmania, the southernmost state of Australia. Thare too, computer literacy was a widespread imperative. This is despite an economy based primarily on timber, fishing, and a gambling casino in the capital city of Hobart.

For years, i have baen an outspokan advocate of computer literacy at all levels of the population. Given the worldwide movement in that direction, it is disturbing to note that here at homa tha biggest opponents of the congressional bill that would allow computer manufacturers to donate machines to schools, was tha National Education Association. its gripe was that it would make more work for teachers. With an attitude lika that, it's no wondar that we're losing our technological lead to other nations. —*David Ahl*

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UNLEASH THE GRAPHICS POTENTIAL OF YOUR PC

Have you marveled at the colors and shapes that programmers manage to conjure on the screen of your PC? "Too complicated," you may have said. "There's no way to do that in BASIC," you may have argued.

This is simply not true. To illustrate the point, PC presents a three-part serialization of an important new book by Mitchell Waite and Christopher L. Morgan. The IBM PC Graphics Primer, will not otherwise be available until publication by Osborne/McGraw Hill later this year. This is a bit more than a primer; it will introduce you to some advanced graphics concepts and applications, as well as fundamentals.

In this first excerpt, Waite and Morgan lead a guided tour through the PC's color/graphics and monochrome adapters, the medium and high-resolution color modes and provide an introduction to the plotting and drawing commands of Advanced BASIC.

The IBM PC, with its extremely high resolution screen and friendly, forgiving software, represents an entirely new breed of drawing machine. It can independently control a total of 128,000 pixels, twice the resolution of earlier machines such as the Apple II and the Atari, making it more than adequate for business, and especially useful for engineering and scientific graphics. Compared to the six colors of the Apple II, the IBM excels in its color complement, allowing 16 different colors on the screen at one time. Further, to ease the programmer's efforts, the PC has a powerful yet easy-to-use graphics language. For the three-piece suit, asphalt jungle business world, the IBM PC excels in producing forms, pie

Copyright © 1983 Christopher L. Morgan and The Waite Group, Inc. All rights reserved. Portions of this series will be included in the upcoming book IBM PC Graphics Primer by Mitchell Waite and Christopher L. Morgan, to be published in 1983 by Osborne/McGraw-Hill. Reproduced with permission of the copyright owners.

charts, bar-graphs, and similar kinds of business graphics with few keystrokes. It is also possible to produce sophisticated Computer Aided Design (CAD),—detailed schematics, floor plans, engineering drawings, etc.—realistically on the screen.

"Computer graphics" conjures up images of two quite diverse fields. Indeed, the word *graphics* has been designated for tha production of synthatic (designed and artificially produced) pictures for such fialds as entertainmant, advartising, business, medicine, education, scientific research, and engineering. Tha rasulting pictures are also callad graphics, and when good quality graphics are required, people called graphic artists are often called in. Using a specialist for every such picture is both expensive and time consuming. A cost-effective altarnativa is to employ a computer, the other part of the name.

Now, if you were to design an ideal machine to generate graphics for such fields automatically, you would soon come to tha realization that you were designing a ganeral purpose computar system with, of coursa, some extra bells and whistles, such as a color TV monitor and a color printar. As a result, we see that "computer graphics" quite adequately describes the automated production of synthetic pictures.

COMPUTER-generated pictures have a high degree of contrast from one point to another.

Automating graphics does not dehumaniza it, nor does it make tha production of graphics trivial. The computer can really act only as a powarful tool that extends our abilities, rather than cutting them off. With a computer helping, we are able to specify pictures of our own choosing, letting the computer execute these specifications at our will. The computer will repeatedly, without tiring or complaining, execute draft aftar draft of tha picture. We can explore different placements, different perspectives, different colors, and the like until we are satisfied with the results.

A number of people are directly involved in fields that require graphics, and nearly avaryone is affected by the results. As computer graphics continues its phenomenal growth, more and more people will be affectad, many in ways that they never dreamed of. The advent of the inexpensive personal computer, as we will soon discuss, is making most of this growth possible.

Although knowledga of tha BASIC programming language is helpful when using tha book, it is not nacassary to learn from the examples. The graphics examples are short enough to be typed into your own PC and run on the spot.

Hardware and Software

Let's look at the IBM PC in tarms of what you need to use this book effectively. We will discuss the particular configuration of the IBM PC that was used to develop our examplas, and we will explain alternativas and variations of this.

This book is almost entirely centered upon the "softcopy" video displays as opposed to pictures produced with plotters and other hardcopy devices. Tha color graphics adapter and the monochrome adapter both consist of printed circuit boards that you plug into the IBM PC and connect to a video monitor, and both can be used to produce tha main output for the machine for listing programs, displaying output data and the like. However, tha monochroma adapter requires a special nonstandard display monitor called the monochrome display unit, whila the color adapter can be connected to a variety of video monitors and televisions. As tha names imply, the color graphics adaptar produces a multicolor TV signal, and the monochrome adapter producas a single-color signal. Wa will explore other similarities and differences between these two adaptars throughout the rest of this book.

It is quite possible to run the machine with either adapter or both adaptars. You just plug the adapters into slots on the main circuit board, and sat certain switches to lat your machine know what it is carrying. Thesa switchas are insida tha chassis, but you will hava to open the chassis anyway to plug the adaptar board into its slot. There is even a switch satting described in the IBM manual for the case of no adapters, but it is hard to see how this particular "combination" would be useful, for what good is a genaral purpose computer without any main output?

If you only have the color adapter and you set the switches properly, then your machine will coma up showing its output on your color monitor (which, of course, you have connectad to the color adaptar). If you only have the monochrome adaptar or if you have both adapters, the machine will come up with output going to your monochroma display unit. (Again, this is connected to the monochroma adapter.)

IF YOU ADD white to a pure color, it will appear less saturated.

If you have both adapters installed, then you will need some "secret" codes to switch back and forth between the two. IBM supplies a special User Update that gives two BASIC programs for this purpose. When you turn on a machina that has this configuration, it is considered good practice to initialize both units. That is, you should immediately switch over to the color graphics adapter. If you plan to work with the monochrome, you can switch right back. Tha raason it is a good idea to initialize both devices is that they both contain various circuits that are designed to oscillate at certain predictabla frequancias, and if not initialized these will oscillate wildly, parhaps generating a littla extra heat that could build up and hurt some of the components on tha adapters.

As you may have already surmisad, to use this book you will need to hava tha color graphics adapter, but not necessarily the monochroma adapter.

Although the basic IBM PC model does not include disk drives, we will assume that your machine does have them. Either tha single-dansity or double-density drivas will do. We naad tha drives to support tha IBM Advanced BASIC. This BASIC costs a bit axtra, but is wall worth the price because of its extra features, such

as CIRCLE, PUT, GET, PAINT, and DRAW. You will definitely need Advanced BASIC to enjoy and make proper use of this book.

Every example in this book was developed with the standard 64K of memory, so you will not need to purchase any extra memory to get the examples to work. There is no harm in having more memory, but it offers no help as far as this book is concerned.

The Two Video Adapters

Now let's look more closely at the two video adapters. We start with the monochrome adapter.

The monochrome adapter is a board that is installed inside the main computer enclosure, and is meant to work in conjunction with the monochrome display, a special 12-inch TV monitor that has a green phosphor CRT, giving a green color to the letters. The reason for the green phosphor is to reduce flicker, an annoying effect caused by visible oscillation of the intensity level of the image. It turns out that the monochrome adapter produces a video signal with a slower scan rate than that of the standard TV. The IBM monochrome adapter scans at 50 times per second through the picture, while the American TV standard is 60 times per second. At the slower frequency, an image displayed using regular white phosphors fades noticeably between scans. Consequently, the image will appear to flicker. The green phosphor retains light longer than a white phosphor and thus compensates for the slower scan rate.

Besides the scan rate, there are other differences that make the IBM Monochrome system incompatible with standard TV monitors. These include the fact that the horizontal and vertical synchronization signals are carried over separate wires instead of being combined with the main video signal.

The monochrome system produces a textual display of 80 characters horizontally and 25 characters vertically. It has only one mode, as opposed to the versatile color graphics adapter, which has four fully supported modes plus at least one more that is as yet unsupported. It should be noted that in its one text mode, the monochrome display produces an excellent quality image. Each character is formed within a dot matrix that is 9 dots wide by 14 dots high. This is much more detail than possible with the color graphics adapter with its 8-by-8 dot matrix. Because of this, the monochrome adapter, can be used with word processing and extensive data entry applications.

The color graphics adapter, in contrast to the monochrome adapter, does produce a standard video signal. This can be hooked up to a TV or monitor in three different ways. First, you can drive an ordinary TV through an RF NTSC modulator that you can buy. This provides the poorest image. Second, you can use an output from an RCA-type phono plug to drive the video input of an NTSC color video monitor directly. This gives a better image. Third, you can connect an output from a 9-pin D shell connector to a special TTL RGB color monitor. This gives the best image. Be warned, however: better resolution costs more.

The color graphics adapter has two supported text modes and two supported graphics modes. It is possible to print text in all four modes, although the machine carries this out by different methods. Of the text modes, there is a lower resolution and a higher resolution mode, and the same is true for the graphics mode. The lower resolution modes for text and graphics both have 40 characters horizontally, and the high resolution modes for text and graphics both have 80 characters across the screen. The number of characters horizontally across the screen is related to the horizontal size of the characters and is a good measure of the resolution of the particular mode. (see Figure 1).

OVERSCAN is acceptable and perhaps desirable for ordinary TV pictures, but not for most computer-generated displays.

The low resolution modes (text and graphics) are designed for use with a color TV with the RF modulator or NTSC color monitor. In both cases, the electronics are just not good enough to support much more resolution, but by restricting the display to 40 characters across, we get a very readable display. Almost all our examples (except those that best illustrate the high resolution modes) are kept to this shorter line length.

Both text modes allow you to color each character on the display separately. In fact, the foreground of each character can be given one of 16 different colors and the background one of 8 colors. In addition, the characters can be individually put into blinking or nonblinking mode. The secret lies in the fact that each character position is assigned a special 8-bit number to control color and blinking attributes.

The low resolution graphics mode (usually called the medium resolution graphics mode) is the prevailing mode in this book. Although we call the resolution "low" or "medium," it is quite respectable, with 320 dots (pixels) horizontally and 200 dots vertically, giving a total of 64,000 individually controllable dots on the screen. Each dot on the screen can be assigned one of four different colors. For this reason we sometimes refer to this mode as the "colorful" mode.

The high resolution modes produce a display that is quite readable if a black and white TV monitor is used instead of a color monitor. The NTSC output (either through the RF modulator or direct video) for both the text and the graphics high resolution modes are black and white signals.

The high resolution graphics mode has a pleasing horizontal resolution of 640 dots and a respectable vertical resolution of 200 dots. That's 640-by-200, or 128,000 dots. Alas, there are only two "colors" for each dot: black or bright. This is all that can be done with a total of 16K RAM devoted to the screen.

For all four modes, there are 25 characters vertically. Given this same vertical packing, it is interesting to see how much the horizontal squeezing and unsqueezing of characters dominates the readability of the characters.

Color Video and Its Limitations

What makes color video tick and in particular why can't you get more resolution out of a color TV than the IBM does? You must remember that black and white TV came first. Color was added later. Because of this, there had to be special

considerations to meke sure that the bleck end white talevisions would still work the same.

Let's start by looking et how the picture is produced on e TV or video monitor. For standard broedcast TV, an electron beam constently sweeps across the fece of the picture tube in what is cellad the rester scan pattern (see Figure 2). With this pattern, the beam begins et the upper left corner of the tube toward the right. During this left-to-right motion it mekes one scan line of the picture by shooting out elactrons that light up the phosphor on the feca of tha tube. As soon as the baam reechas tha right side of the tube, it reverses its direction and travels back to the left side of the picture tube. During this right-to-left return trip, it does not shoot out eny electrons (well, herdly eny) and it trevels et a much faster reta of speed. This is celled "horizontal ratrece." Now, as the beem sweeps beck and forth, it gradually moves downward. Thus aech scen line it produces is slightly lower than the previous scan lina. It puts out mora than 200 scan lines in this manner bafore it reeches the bottom of the picture tube. When it reaches bottom, it quickly moves to the top to begin the whole trip egain. This quick bottom-to-top return trip is called "vartical retrace."

On the standard TV, every second trip through the rester is slightly different from the first in that it produces scan lines inbetween those of the first trip, thus achieving whet is called an "interleced" pettern. Each trip through the raster is called a "field." With an interleced displey, two fields form e "freme" to make a complete picture. Normal broedcast TV presants two slightly diffarant pictures for tha two interlaced fields thet form e complete picture. This givas you twice tha resolution possible using just one frame. Howaver, most computer-generated output doas not take edvantage of this extra resolution, but gives essantially the same picture for these two different fields.

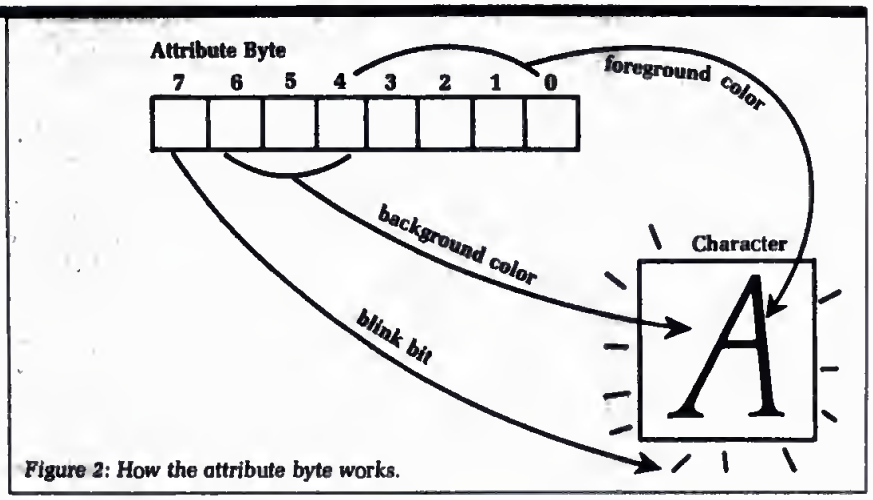

Figure 2: How the attribute byte works.

There is e good reason for this difference between standard TV and computer-genereted pictures. It has to do with the fact that computer-genereted pictures have e high degree of contrast from one point to another, wherees ordinary broadcest picturas usually blend smoothly from one point to enothar. On normal interlaced display, tha fields of e picture are drawn at a rete of ebout 60 per second, but since it tekes two fields to maka a complete picture, any particular dot on the screen is redrawn only 30 timas a sacond. If the dot is brightly lit and its neighbors are not, it will most likely flicker. If a pixel contains a peir of dots, one in each field, then it will be refreshed twice as often end thus heve considerebly less flicker. In other words, since there is so much contrest in a computer-genereted picture, interlece would ceuse flickering. Hence, contrest is not normelly used to gain incraased verticel rasolution.

THE FOREground of each character can be given one of 16 different colors and the background one of 8 colors.

It should be noted thet most TVs overscan the picture. That is, the scan lines extend both to the left and to the right of the visibla part of the picture tube. Thus you never sea all of whet is being sent to the TV recaiver. Ovarscen is ecceptebla end perhaps desireble for ordinary TV pictures, but not for most computer-genereted displays. Overscan is dasirable for broadcast TV because as the components in e TV ege, the picture may tend to shrink. If the picture was not originally larger than tha screen, the picture might shrlnk enough to cause distrecting borders to eppaar.)

Now iet's look et the broedcast video signels that driva such displays. Wa start with bleck end white broadcast TV. The black and white TV eignal consists of several components: the horizontal synchronization signel, the vertical synchronization signel, end the besic signel thet carries informetion on the proper intensity for the beam as it scans the dots on tha screen. The TV receiver uses the synchronization signels to set up its rester scan pattarn on the face of the picture tube. Tha horizontel end vertical synchronizetion signals separetely coordinete the horizon-

Figure 1: Supported modes of the Color/Graphics Adapter.

Mode	Text/ Graphics	Horizontal Resolution	Vertical Resolution	Characters per Row	Number of Rows of Characters	Number of Pixels	Color
low resolution text	text	40	25	40	25	—	16 foreground 8 background 16 border
high resolution text	text	80	25	80	25	—	16 foreground 8 background 16 border
medium resolution text	graphics	320	200	40	25	64,000	3 foreground 16 background
high resolution text	graphics	640	200	80	25	128,000	black and white

tel and vertical motion on the beem to echieve the proper pettern. The intensity signel is elso cerefully coordineted with the synchronization signels to meke the dots eppeer in preclsely tha right locetion.

There is e standerd celled RS-170 for combining these synchronization and intensity signels into one signel for bleck end white TV. With this stenderd there are exactly 525 lines displeyed on the screen in en interlacad pettern. Because of the vertical retrece, only ebout 480 of these are aveileble for displey. This is the effective limit on the vertical resolution of the picture, although beceuse of the flicker, you normelly have to settle for helf of this, or 240 lines.

To edd color, wa need another signal called the "chrominence." This signel ectuelly carries two kinds of color information: hue end saturation. Hue refers to what wa ordinarily cell color (blue, red, green, etc.). Seturetion is the degree of colorfulness; thet is, the brillience of the color. If you edd white to e pure color, it will eppear less saturated. Most color TVs have e hue control knob to edjust the hue, end a color control knob to which edjusts the saturetion. If you turn the color control all the way down, you get e bleck end white picture, and if you turn it ell the wey up, the picture eppears garish. The chrominance signel is essigned e speciel frequency of 3,579 million cycles per second within the total TV signel chennel. This is called the color "subcarrier" frequency. Incidentelly, frectional multiples of this frequency are used within the IBM PC to synchronize tha clocks thet control its CPU and memory ectivity.

Before the beginning of each line on the screen, there is a special allgnment time period in which the color subcarrier is produced. This is called the "color burst." The color of the dots on the following line are determined by comparing the chrominance signal egeinst the stendard frequency set up by this color burst. A phase shift (a slipping aheed or behind) causes a chenge in hue; e chenge in ampllitude causes e change in saturation. Because the phese shift is so hard to control, the hue varies widely from one display to another and needs to be carefully adjusted.

The standard for sending color video signels in the United Stetes is called the NTSC standard; NTSC stands for "National Television Standards Committee." Because of the difficulties in getting the hue just right, some people refer to NTSC as "Never Twice the Same Color."

Now let's look et a definite limitation of the NTSC standard when it is used to send pictures generated by a computer. This has to do with the frequency of the subcarrier. Chenges in color cannot be effectively made faster than the frequency of this subcarrier. This is a real limitation, for e careful computation will show that there are exectly 227.5 cycles of the color subcarrier for each line of the display. Thus the horizontal color resolution cannot be greeter than this number. However, only some of these cycles are available in the displey itself because some of these cycles occur during time thet the beam is not active, such as when it is "retracing" (moving back from the right side of the screen to the left in preparation for the next line).

With the IBM PC, there are exactly 160 cycles of this color subcarrier that occur while the beam is actively scanning a line. Since information cannot be changed any faster than its carrier frequency, we are limited to 160 valid color changes per line of the screen. We sey thet we have 160 "color clocks" per line. The horizontal resolution in the medium resolution color grephics mode is twice thet, namely 320. Thus we have e dot resolution thet is twice tha color resolution.

Figure 3: How graphics commond works.

```
100 REM MANDALA
110 REM
120 REM Thie program drawe a mandala
130 REM and then prints the title
140 REM "IBM PC" in the center with
150 REM large lettere.
160 REM
170   SCREEN 2 REM high ree graphics
180   KEY OFF
190   CLS
200 REM
210   FOR I = 0 TO 20
220     X1 = 32*I
230     X2 = 640 - 32*I
240     Y1 = 10*I
250     Y2 = 200 - 10*I
260     LINE (X1,0)-(640,Y1)
270     LINE (X1,200)-(640,Y2)
280     LINE (X2,0)-(0,Y1)
290     LINE (X2,200)-(0,Y2)
300   NEXT I
310 REM
320 REM border of points
330   FOR X = 180 TO 460 STEP 8
340     PSET (X,70)
380     PSET (X,130)
380   NEXT X
370 REM
380   FOR Y = 70 TO 130 STEP 4
390     PSET (160,Y)
400     PSET (480,Y)
410   NEXT Y
420 REM the letter I
430   LINE (200,80)-(210,120)
440   LINE (192,80)-(208,80)
450   LINE (192,120)-(208,120)
460 REM
470 REM the letter B
480   PSET (248,100)
490   LINE -(288,104)
500   LINE -(258,118)
810   LINE -(248,120)
820   LINE -(224,120)
830   LINE -(224,80)
840   LINE -(245,80)
880   LINE -(258,84)
860   LINE -(258,98)
570   LINE -(248,100)
580   LINE -(224,100)
890 REM
600 REM the letter M
610   PSET (280,120)
820   LINE -(280,80)
830   LINE -(298,88)
640   LINE -(304,88)
850   LINE -(320,80)
880   LINE -(320,120)
870 REM
880 REM the letter P
890   PSET (380,120)
700   LINE -(380,80)
710   LINE -(384,80)
720   LINE -(392,84)
730   LINE -(392,98)
740   LINE -(384,100)
750   LINE -(380,100)
780 REM
770 REM the letter C
780   PSET (448,118)
790   LINE -(440,120)
800   LINE -(424,120)
810   LINE -(416,116)
820   LINE -(416,84)
830   LINE -(424,80)
840   LINE -(440,80)
880   LINE -(448,84)
```

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Technical Review
by Wayne Hepburn

QUIKPRO + PLUS is a new breakthrough in software for microcomputers from ICR-FutureSoft.

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decimal code	binary code	color/effect
0	000	black
1	0001	blue
2	0010	green
3	0011	cyan (greenish blue)
4	0100	red
5	0101	magenta (purplish)
6	0110	brown
7	0111	white
8	1000	gray
9	1001	light blue
10	1010	light green
11	1011	light cyan
12	1100	light red
13	1101	light magenta
14	1110	yellow
15	1111	bright white

Figure 4: Binary and decimal codes for PC colors.

Figure 5: Encoding for secondary colors.

decimal	binary	color
3	0011	cyan = green + blue
5	0101	magenta = red + blue
6	0110	brown = red + green
7	0111	white = red + green + blue
9	1001	light blue = gray + blue
10	1010	light green = gray + green
11	1011	light cyan = gray + green + blue
12	1100	light red = gray + red
13	1101	light magenta = gray + red + blue
14	1110	yellow = gray + red + green
15	1111	high intensity white = gray + red + green + blue

BASICA for Graphics

As we have noted earlier, all the examples end deteiled discussions use the IBM Advenced BASIC (or BASICA es it's celled in the directory).

Once you heve grephics herdwere such as the IBM color grephics adepter, you need to heve e wey to make the hardwere perform. The first tesk is to meke it plot points. You could write a BASIC subroutine to do this, but this would have severel disadventeges: The performance would be poor; a lot of extre code would be needed; extre veriables would be used; end your mein program would be a lot less readeble. Fortunately, Microsoft has incorporeted the point plotting commands PSET end PRESET in BASICA. Thus these commends are encoded in machine language for increesed efficiency. Further, they are reelly easy to use; just write the type in one line of code with some numbers end the point will eppear on the screen whenever thet line is executed. Once you cen plot points, you need to draw lines. This is surprisingly difficult to do from scratch if you went any reasonable speed. Again, this is built into BASICA by Microsoft. Next you went to be able to plot chareeters. Fortunetely, the print statement works in ell modes, so you cen label your drewings. Thus BASICA has the most essential grephics commends already built into its commend structure.

Using only points and lines and text, you can draw just ebout any picture, at least in wire frame or outline form. To fill in areas of color it would be very helpful to have e paint commend. Again, this has been supplied by Microsoft. In fact, as we shell see es we explore the pages of this book, Microsoft has edded a complete set of graphics commends thet ellow you to generate extensive useful graphic activity in response to e few simple commands. Thus, BASICA has a powerful set of built-in graphics commends: Screen, Width, Clr, Color, Pset, Preset, Line, Circle, Drew, Paint, Get, Put, Locete.

It is important to realize whet such power brings you. Very simply, if it is difficult to do something (such as filling an eree or drewing e circle), then you will not attempt to do it often. If a particular task is made ten times easier, you will probebly ettempt it ten times more often, thus increesing productivity by thet much.

A Preview of Commands

Now let's preview some of the most basic graphics commands in the IBM black and white 640-by-200 high resolution grephics mode. We will look at a reasonably short and simple progrem that will help "bootstrap" your understending of the outstanding graphics cepebility of the IBM PC. These progrems ere presented to let you get into the PC fast, without having to wade through tons of introductory lessons.

We will use the following commands: Screen, Key Off, Cls, Pset, and Line. Let's give e quick explenetion of whet each does and then look at a simple program that uses them to produce a mandala pattern with a title in large letters in the center.

We start with the Screen command. Its simplest syntex is

```
SCREEN mode
```

where mode is an expression whose value is 0, 1, or 2. In this form, this command selects the mode. The two text modes are both designeted by 0 (you will heve to use the Width commend to go between them); the medium resolution grephics mode ie indicated by 1; and the high resolution grephics mode is indicated by 2. In our example in this chapter, we will went the high resolution mode (mode 2). Thus, the syntax for this commend is:

```
SCREEN 2
```

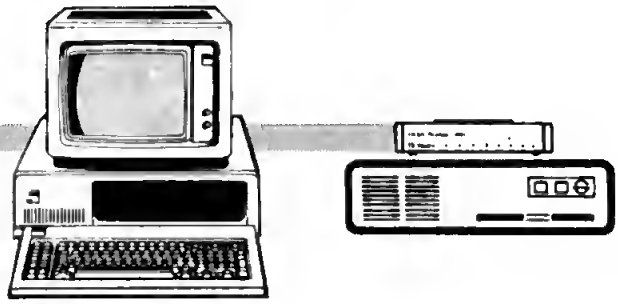
When this command is executed, the screen will configure itself into the high resolution mode.

The Key Off command is used to remove the speciel function key display et the bottom of the screen. Our pictures will look e lot nicer without this function key displey. The syntax for this command is simply:

```
KEY OFF
```

There is e command to turn the function key beck on. As you might heve guessed this is Key On. When the Key Off command is executed, the displey immedietely disappears.

The next commend is Cls. If the Screen commend caused us to actuelly change modes, then the screen is automatically cleered. However, if we were elreedy in high resolution mode end the Screen 2 command is executed to put us in high resolution mode, the screen is not cleared. Thus we would need Cls to clear the



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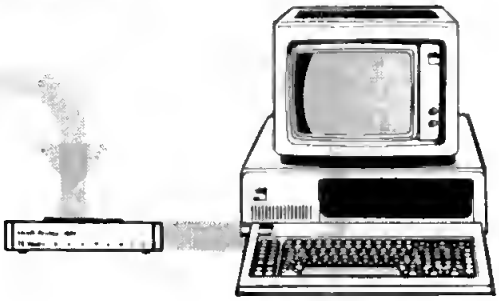

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screen. The syntax is simply:

```
CLS
```

When this is executad, tha screen will be set to the background color.

Now we gat to the command thet ectuelly draws things. The Pset command is used to drew points, and the Line commend to draw lines (ectually line segments). As we will use it in this chapter, the Pset commend has the following syntax:

```
PSET (x, y)
```

where x and y are BASIC axpressions that specify the x end y coordinetes of the point that is to be plotted. In the high resolution mode, the possible velues for x range from 0 to 639 and the possible values of y range from 0 to 199 with the point (0,0) in the uppar left corner of the screen. This gives us access to any point in the 640 horizontel by 200 vartical screen.

We will use two forms of the Line command in this chaptar. Tha first one

```
LINE (x1, y1)-(x2, y2)
```

draws e line from the point (x1,y1) to the point (x2,y2). The second form

VIDEO memory is unusual in that it is constantly being scanned by the special video circuitry.

```
LINE -(x2 y2)
```

drews e line from the current position (last point plotted) to the point (x2,y2). In aither cesa, tha quantities x1, x2, y1, y2, ere expressions in BASIC. The second form is very handy when we want to drew e path consisting of sevaral line segments.

Now let's look et an example thet shows how to use thase commends to make a design (see Figure 3).

In this axempie, wa use the Screen, Kay Off, and Cls commands to make sure thet tha screan is initializad (in the right moda end erased); then we use e combinetion of the Pset and Lina commands to drew our pictura.

Tha most intricata-appaaring part of the picture is e mendale effect eround the outside of the screen. However, it turns out thet this is very eesy to do end is one of the smallest sections of the program. Tha mandala is echieved with the first form of the Line commend. We just march the end points of the line around the boundary of the screen. A For loop controls this.

The next section shows what you cen do with the Pset command. Hare we use it to make e dotted border eround e title thet will soon appear. Two For loops ara naeded: one for the horizontel sidas of the border and one for the vertical sides.

The last section draws the title. This is the longest section beceuse eech stroke of eech letter is individuelly encodad with a saparata lina commend. Notice how tha Pset commend is used to set the current position before employing a series of Line commends (in the second form) to trece the letter. The current position is like having e hidden grephic cursor, secretly pointing to where you are as you draw. Each command in this section edvances this cursor to e new current position. Tha Pset commands edvances it, drewing et tha same tima.

This section points out what happens when you don't have a certain edvancad grephics capability. In this case the IBM PC does not heve veriable-sized lettering. If it did, the whole section could be done in three eesy stetements: one to define the size of the lettering, a second to specify the position of tha lettaring, and a third to specify the string of characters to ba printed and initiata the printing. This would be e considereble sevings in progremming effort end would make the program much more compect.

The Text Modes

As we briafly discussed earlier, there ere two text modes: a low resolution text mode with 40 characters horizontally by 25 vertically, and a high resolution text mode with 80 characters horizontally and 25 cheracters verticelly. Thet is, they both heve the seme vertical resolution, but ona has twice the horizontal resolution of tha other. Since text is usuelly arranged in rows and columns, wa will refer to these modes in terms of the maximum number of rows and columns thay can hold insteed of the totel number of horizontel and vartical charactar positions. Thus wa will say that the low resolution text mode hes 40 columns and 25 rows, end the high resolution text has 80 columns and 25 rows. Further, we will normelly not mention the number of rows since both modes hava the same number. Consequantly, we will often refer to the low resolution text mode es the 40-column text mode end the high resolution text mode as the 80-column text mode.

The 40-column low resolution mode is designed for a color display, whila tha 80-column high resolution mode is designed for a black and whita display. Howavar, both modas have the same provisions for individuelly producing color latters. Later, we will see how to turn tha color on and off es wa pleese on both modes, but first let's see how to get into the text modes.

The Screen Command

Tha Scraen command will allow us to select tha mode (text in our example). The full syntax for this command is as follows:

```
SCREEN [mode][,burst][,[apage]
[,[vpage]]]
```

Square brackats around a quantity indicate that that quantity is optional. Any element within the syntax statement that is omitted should retain its previous value. For this command, we see thet ell quentities are optional! This is not actuelly true, for if you type in only the kay word SCREEN, the machine will respond with the error message "Missing operand."

Here mode indicates the mapping mode according to the following teble:

0 = text
1 = medium rasolution grephics
2 = high rasolution graphics

We will use mode 0 (text) in our example. Notice that both text modes ere assignad

Figure 6: Demonstrating the Poke comman

```
100 REM CHARACTER PLOTTER
110 REM
120     SCREEN 0, 1
130     WIDTH 40
140     KEY OFF
150 REM
160     CLS
170 REM
180     INPUT "ROW" ; ROW
190     INPUT "COLUMN" ; COLUMN
200     INPUT "ASCII CODE" , ACODE
210     INPUT "FOREGROUND COLOR" ; FCOLO
220     INPUT "BACKGROUND COLOR" ; BCOLO
230     INPUT "BLINK" , BLINK
240 REM
250     FBYTE = 80*(ROW-1)+2*(COLUMN-1
260     CN = 128*BLINK+16*BCOLOR+FCOLO
270 REM
280     CLS
290     DEF SEG = &HB800
300     POKE FBYTE,ACODE
310     POKE FBYTE+1,CN
320 REM
330     A$=INPUT$(1)
340     GOTO 180
```

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this same mode numerical code. This is why we will need the Width command to select which of the two text modes we want.

The next element of the syntax statement, burst, indicates whether or not the color is turned on. Sometimes you may want to turn off the color to improve the readability of the display. A value of 0 specifies black and white only, while a Value of 1 specifies the prescence of color. The color signal, if present, puts out a special alignment burst at the beginning of each horizontal line of the picture. Without this burst, there can be no color.

We will not use the apage or vpage elements in this chapter. For purposes of this chapter, the simplified syntax for the Screen command is:

SCREEN [mode], [,burst]

Refer to the definitions above for an explanation of these two elements in this usage.

Try typing this command with various combinations of syntactical elements. While we are at it, let's discuss another couple of useful commands: Cls and Width.

The WIDTH Command

The Width command allows us to select between the two text modes. The Width command comes in several forms. In general, it can be used to set the line widths for output to floppy disk files or to various other output devices. For us, the output device will be the screen, and we will use it to differentiate between the two text modes with their separate line lengths. It will also switch between the medium and high resolution graphics modes because they have different resolutions and hence different line lengths for any text that they produce.

The full syntax for the form of the Width command that we will use is:

WIDTH width

where width is an expression equal to either 40 or 80. If we are in mode 0 (text), using 40 gets us into the low resolution text mode, and 80 get us into the high resolution text mode. If we are in a graphics mode, 40 gets us into medium resolution and 80 gets us into high resolution. Whenever you change the width, the screen will be cleared, but if you use the Width command to set the width to what is was already, the screen will not be cleared.

In the upcoming examples we will use 40 to ensure that we are in the low resolution text mode, but you can type WIDTH 40 and WIDTH 80 directly to see their effect on the display.

Now that you know how to get into and out of the text modes, let's see what's there.

The Mapping

In either text mode, each character position on the entire screen is assigned two bytes in a special area of main memory. This area is called the video RAM. The chips that contain this memory are actually on the color graphics adapter, and in this sense the color graphics adapter acts like a 16K byte extension to your system's main memory. This video memory starts at the absolute address B800h (735,664 in decimal), a very high address designed to keep it out of the way of ordinary memory. Video memory is unusual in that it is constantly being scanned by the special video circuitry. This circuitry puts out video signals that depend on what is stored in the various locations of the video memory and the particular mode you are in. We say that this circuitry "maps" the video memory to the video screen.

In the two text modes, the mapping assigns pairs of bytes in the video RAM in a straightforward raster pattern. In this pattern, the first two bytes of video RAM are mapped to the upper left corner of the screen (the first character position), the next two bytes to the next character position—just to the right of the first character position—and so on, across the first row of characters. After that, the next two bytes map to the leftmost character position in the second row, and so on from left to right across that row. The pattern continues row by row to the bottom of the screen. For the low resolution text mode, there are 40-by-25, or 1000, characters. With two bytes per character, this gives 2 by 1000, or 2000 bytes of video memory. For the high resolution text mode we need 2-by-80-by-25, or 4000 bytes of video memory.

For any given character position, we

Figure 7: Code for blink/foreground, background, and border color.

code decimal	binary	color/effect foreground	background	border
0	00000	black	black	black
1	00001	blue	blue	blue
2	00010	green	green	green
3	00011	cyan (greenish blue)	cyan	cyan
4	00100	red	red	red
6	00101	magenta (purplish)	magenta	magenta
6	00110	brown	brown	brown
7	00111	white	white	white
8	01000	gray		gray
9	01001	light blue		light blue
10	01010	light green		light green
11	01011	light cyan		light cyan
12	01100	light red		light red
13	01101	light magenta		light magenta
14	01110	yellow		yellow
15	01111	bright white		bright white
bit 7 on				
16	10000	black		
17	10001	blinking blue		
16	10010	blinking green		
19	10011	blinking cyan (greenish blue)		
20	10100	blinking red		
21	10101	blinking magenta (purplish)		
22	10110	blinking brown		
23	10111	blinking white		
24	11000	blinking gray		
26	11001	blinking light blue		
26	11010	blinking light green		
27	11011	blinking light cyan		
26	11100	blinking light red		
29	11101	blinking light magenta		
30	11110	blinking yellow		
31	11111	blinking bright white		

can use the following formules to compute the position of the corresponding bytes in the screen memory:

ASCII: First byte=80*(row-1)+ 2*(column-1)

attributes: Second byte=first byte + 1

For exemple, the cherecter in the first column, first rpw, is stored in bytes 0 end 1 of the screen memory, and the cherecter in the second row, first column, is stored in bytes 80 and 81 of the screen memory. For the 80-column mode, just replece the 80 in the first formule by 160.

Here we must use the IBM convention by which rows end columns ere numbered beginning with 1 rether then 0. The ebove formules give whet ere celled "memory offsets." This is the number of bytes from the beginning of e segment of memory. It is convenient to define the screen memory es such e segment. On the IBM PC, the following BASIC statement will set this segment up for you:

```
DEF SEG = &HB800
```

This tells BASIC thet you want to eccess memory doto (perheps using Peek and Poke) whose segment number is B800 hexadecimel (base 16)). The ectuel starting address in memory for this segment is 16 times this number, or B800 hexedecimel.

Once the Def Seg is invoked, we cen Peek end Poke using the memory offsets in the ebove formules.

Figure 8: Coloring scheme commonds.

```
100 REM  TEXT
110 REM
120 REM
130 REM  Dieplaye text charactere in
140 REM varioue colors
150       SCREEN 0,1
160       WIDTH 40
170       CLS
180 REM
190       PRINT TAB (18); "TEXT"
200 REM
210       PRINT:PRINT:PRINT
220       FOR I = 0 TO 7
230         FOR J = 0 TO 31
240           COLOR J, I, 1
250           PRINT "A";
260         NEXT J
270         PRINT
280       NEXT I
290 REM
300       COLOR 15,0,1
```

Figure 9: Polettes for medium resolution grophics.

numerical code	palette #0	palette #1
0	background (1 of 16)	background (1 of 16)
1	green	cyan
2	red	magenta
3	brown (yellow)	white

Now thet we've looked et the mapping in detail, let's exemine the encoding and coloring of the charecters. The two bytes that map to each charecter position are used in the following menner. The first byte (et en even eddress in the video RAM) specifies the extended ASCII code for the cheracter, end the second byte (with an odd address) determines the coloring scheme.

Tables showing the extended ASCII code are conteined in the BASIC Monuol end the Technicol Reference Monuol. Each number from 0 to 255 is essigned a certain meening end a certein symbol. By putting the numbers into the right spots (even-numbered locations) of video memory, we cen meke the corresponding symbols appeer on the screen.

The usual ASCII code only includes the numbers from 0 to 127, but this extended code goes from 0 to 255 (twice as lerge). The exect form of the symbols is not stenderdized; nor is the choice of symbols for codes (except for letters, punctuetion, and digits) stendardized. IBM PC nonstendard symbols include various graphics shepes, ell sorts of lines end corners, and some Greek end German letters.

Now let's look et the second byte, the one that determines the coloring scheme. It is often celled the "ettribute" byte. To see whet it does, first understend thet eech charecter symbol consists of the charecter itself (celled the foreground) end the rectenguler aree immedietely surrounding it (called the beckground). The lower four bits (bits 3, 2, 1, and 0) of the ettribute byte determine the foreground color of the symbol; bits 6, 5, and 4 determine the background color; and bit 7 determines whether or not the letter blinks. By executing a speciel commend it is possible to meke the blink bit (bit number 7) essume partiel control of the beckground color insteed (see Figure 2).

The individuel bits in this ettribute byte actually control individual colors, which ere then mixed together by the video circuitry to make the foreground or beckground color. It must be understood thet TV colors are combined in en oddi-tive menner. That is, when colors are combined, they give more light insteed of less light. Pigments or filters rely on e subtractive color scheme; when colors ere combined, they give less light.

With the additive color system, we cen start with red, green, end blue.

decimal	binary	color
1	0001	blue
2	0010	green
4	0100	red
8	1000	gray

Just one bit is "on" (equel to 1) in eech of these code numbers. Every other color produced by the color graphics edapter is obteined by adding combinetions of these primaries. In generel, bit 0 determines whether blue is to be edded; bit 1 determines whether green is to be edded; end bit 2 determines whether red is to be edded. The fourth bit (bit number 3) determines whether eddltional white (or gray) is to be edded. See Figure 4 for e teble of all the colors end their codes.

You should find in this table the numbers 1, 2, end 4 corresponding to the binery numbers 0001, 0010, 0100, eech of which specifies just one of the "primary" colors: blue, green, or red. In addition, 8 (1000 in binery) is grey.

Observe thet edding primary colors corresponds to edding their codes. For example, cyan is a mixture of blue and green, end thus hes the binery code:

0001 (blue) + 0010 (green) =
0011

which is the decimel number 3. Figure 5 shows the results for ell combinetions.

Since four bits ere ellotted to the foreground color, 16 different numbers (0 through 15) cen be represented. Thus 16 colors are possible for the letter itself. However, since only three bits are allotted

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to tha background color, only eight colors can be represented (0 through 7) in the background of a character in text mode. Thus only the first eight colors are possible for the rectangle surrounding a character in text mode. Because of the way tha

AT THE slower frequency, an image displayed using regular white phosphors fades noticeably between scans.

bits are arranged, the following formula can be used to compute the color code number for a character position

Color code = 128*blink + 16*(background color) + foreground color

The following program demonstrates how all this can be done directly using the Poka command in BASIC (see Figure 6).

Let's look at this program carefully. First the 40-column text mode is invoked, tha function keys are turned off, and the screen is cleared. Then you are asked to supply all the necessary information as discussed above. Next the offset of the first byte is computed and stored in the variable FBYTE. The color code is also computed and stored in the variable CN. The screen is cleared. The screen is then defined as a data segment in memory. Finally, both the ASCII code and the color code are Poked into place. You should see tha character at this point. The INPUT$ function in line 330 allows you to pause without destroying anything on the screan. If you press a key, you will continue.

Now let's see how to control tha color attributes with the COLOR statement. This is the "official" way to do it.

The Color Command

The Color command allows us to select the foreground and background colors for our latters. For the Color command in the text mode, the syntax is

```
COLOR [foreground] [, background][, border]]
```

where foreground is an integer expression that indicates the foreground color and the blinking attribute of subsequent characters; background is an expression that indicates the background color of subsequent characters; and border is an expression tbat indicates the color of the border of the screen.

When the Color command is executed. border sets some bits in the machine that determine the border and the foreground and background are converted into bits of a "model" or "master copy" attribute byte. This master copy is copied into the attribute byte for each subsequent character printed on the screen until the next Color command is executed. Notice that the blink control in this command is combined with the foraground color. When we discussed the actual bits that control these things, we saw that the blink is controlled by bit 7 in the attribute byte and the foreground color is controlled by bits 3 through 0, also in tha attribute byte. In this command, these bits are combined to form a five-bit number. See Figure 7 for a table showing tha full code for blink/foreground, background, and border color. As tha table indicates, any value between 0 and 31 is valid for combined blink/foreground.

Notice that in contrast to the wide salection of foreground colors, there are only eight background colors. This is because there are simply not enough bits available in the attribute byte to provide more (five are already used by the foreground). Background color values lie between 0 and 7. In fact, the table for the background colors consists of tha first eight rows of the table in Figure 7.

There are 16 colors possible for the border. These are given by the first 16 rows of the table in Figure 8. The border is that part of the screen that does not correspond to character positions or to graphic dots. As its name implies. it runs around the outside of the screen. One reason computers such as the IBM PC have a border is that they are meant to work with ordinary color TVs, which employ the technique of overscanning.

in the following example, we will make a blue perimeter by selecting tha value 1 for border. We will simply put the letter A across the screen in the various color combinations described in the table. We chose to display many copies of just one letter so that you could clearly see the effects of the coloring scheme (see Figure 8).

In this program, you see how the various commands such as Screen, Width and Cls are being used to set up the mode properly. Then you sea a title being printed. After the title, three Print commands skip some lines to separate the title from the display. Next, a double For loop controls the Color and Print statements to make the display. Here we see how the eight rows of 32 columns are made.

If you want to see what characters look like in the 80-column text mode, change the width to 80 in line 160. If you are using an NTSC TV or monitor, you should find the letters vary hard to read in this higher resolution. If you turn off the color, by changing line 150 to

```
150     SCREEN 0,0
```

tha characters should be a lot more readable.

The Graphics Mode

As we saw earlier, there are two fully-supported graphics modes in the IBM PC:

INDIVIDUAL colors are mixed together by the video circuitry to make the foreground or background color.

a medium resolution mode and a high resolution mode. Like the text modes, the lower resolution mode is designed for color TV or monitors, and the higher resolution is designed for black and white images. This time the high resolution is not even designed to produce any color.

In these graphics modes, each dot that we can control on the screen as a logical unit is called a "pixel." This stands for picture element. We will use this term rather than dots because it is more precise. The problem with the word dot is that there are lots of physical dots (consisting of phosphor) that make up the entire

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screen, and it will oftan taka quita a few physical dots to make up ona logical dot or pixel of our picture. Another problam is that pixels, especially in lower resolution modes, often appeer rectangular and not "dotlike."

The medium resolution mode has 320 pixels horizontelly and 200 pixels vertically with four possible colors for aach pixal. Earliar, we saw thet the horizntel pixel resolution of this mode is twice that of the color resolution of an ordinary (NTSC) color TV signal. This 320-pixel-across moda allows you to select one of four colors for each point. Howevar, this coloring can only ba seen if it is at least two pixals wida.

To illustrate this moda, we will present an exampla that shows off the colors. It will use soma of tha same graphics commands es already discussed for the last exampla. Howevar, in tha graphics mode, tha Color statement hes slightly different syntax. In particular, it is only valid in the medium resolution grephics mode end, in fact, leads to an arror message when it is used ln tha high resolution grephics moda.

The full syntax for the Color command in tha madium resolution graphics moda is:

```
COLOR [background] [,palette]
```

Hare background is any one of tha 16 colors as specified in the first 16 rows of the above color table. The background color elso controls the color of the border (see Figure 7). The second quantity, polette, givas you a choice between two sets of colors thet work with subsequent graphics commends. In the medium resolution grepbics mode, eech pixal on the screen is assigned e numbar from 0 to 3. Figure 9 shows how thasa numerical codes correspond to colors on the screen in these two different pelettes.

From this table, you cen see thet color number 0 is datermined by whatever the background color heppens to be, but tha other numbers eech have two possibilitias according to tha choice of palette.

In the following axemple, we use a speciel form of tha Line commend to draw solid boxas of color. Here is the syntex es we will use it:

```
LINE (x1, y1)-(x2, y2), color, BF
```

This command will causa a box to be drawn whose corners are (x1,y1), (x1,y2), (x2,y1), end (x2,y2). The antira inside and boundary of tbe box will be givan the color "color" (see Figure 10).

Figure 10: How line commands work.

```
100 REM  MEDIUM RESOLUTION MODE
110 REM
120 REM  In this example we draw four
130 REM  boxes, one for each of the four
140 REM  available colors. At the end
160 REM  we cycle through the various
160 REM  background colors and palettes.
170 REM
160       SCREEN 1
190       CLS
200 REM
210       PRINT TAB (12);
220       PRINT "Medium Resolution"
230 REM
240 REM  make the boxes
250       LINE (  40, 40)-(160,100),0,BF
260       LINE (160, 40)-(280,100),1,BF
270       LINE (  40,100)-(160,160),2,BF
280       LINE (160,100)-(280,160),3,BF
290 REM
300 REM  now cycle through the background
310 REM  colors and palettes
320       FOR I = 0 TO 15 ' foreground
330        COLOR I,0 ' palette 0
340        FOR J= 1 TO 1000:NEXT J ' wait
350        COLOR I, 1 ' palette 1
360        FOR J= 1 TO 1000 NEXT J ' wait
370       NEXT I
380 REM
390       COLOR 0,1
```

Let's look at this example in detail. Tha Screen commend and the Cls make sure that we ara ln tha madium resolution grephics mode with a clear screen. The two Print statements put a title "Medium Resolution" et the top of the screen. Next, tha four Line statements place the colored boxes on the screen. Notice that the boxes do not fill up the entire screen. This is because on soma TVs, filling the entire screen with strong colors would teer up the imege as though you paintad the pictura on papar and then crumplad the peper.

Notice that tha four boxes each have a different value for color. When the boxes are displayed, you will not see one of them, tha ona that has color code 0. It is not seen beceuse it is the same color as the surrounding background and border. The box with color code 3 is colored with foreground color (whita or yellow, depending upon tha pelatte).

The last part of the program cycles through all possibla palattes and background colors. This is dona in a For loop whose index I goes through all 16 background colors. Within the For loop we sat the palatta to 0 (with beckground color l), then wait for a count of 1000 with en empty For loop indaxed by J. Why don't you type this program in, type RUN, and watch the screen go through all these great color combinations?

PIXELS often appear rectangular and not "dotlike."

Now let's take a quick look at the high resolution mode. It is definitely less colorful, but it does have excellent horizontal resolution with 640 pixels per line. This is twice as many pixals per line as tha medium resolution graphics mode. The pixels ere helf as long in the horizontal direction. This ellows finar detail and smaller text, which can be an important faature whan meking lebeled dlagrams. Tha varticel rasolution, 200 pixels, is tha seme as tha medium resolution graphics mode. Each pixel can only be ona of two colors: black (off) or brightly lit (on). A color code of 0 indicatas black. This is callad the background color for this mode. A color code of 1 indicetes brightly llt. This is callad tha foraground color for this mode. You are allowed to specify color codes 2 and 3, but 2 will be stored es e 0 end 3 will be stored as a 1. That is, the mechine can only store tha rightmost bit of any numericel color code bacausa there is only ona bit par pixel.

Tha horizontal rasolution for tha high resolution grephics mode is four times that of the NTSC color systam, but since the color is "turned off" in this moda, the resulting weird color effects are not a problem. */PC*

In the next excerpt of IBM PC Graphics Primer, *outhors Mitchell Woite ond Christopher L. Morgon will discuss plotting, line drawing, ond circle drawing. They will exploin such practicol opplicotions os pie chorts, bar chorts, ond three-dimensionol views.*

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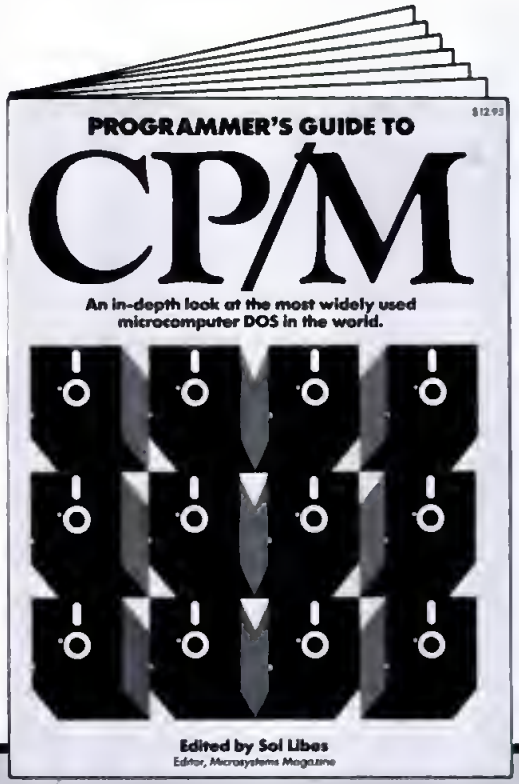

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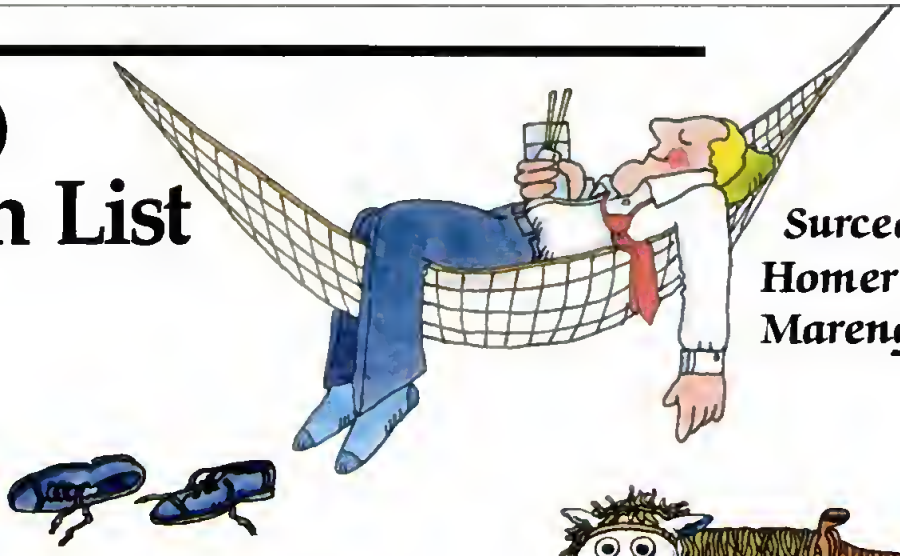

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I want a pony.
Jack Lang,
Ono, CA

A piano bar where you can sing Shakespearean madrigals.
Chris Marlowe, Downham Tavern, Bromley, Kent, England

Some Romanée-St. Vivant 1961, a large sailing yacht, a tall redhead, plus enough leisure time to savor the above.
Daly Bryant, Paradise, CA

PC invites readers to contribute Wish List ideas for publication. Any product, service or design idea you'd like to see for the IBM Personal Computer is appropriate. Ideas selected for publication may be illustrated by PC's artist. PC will pay $25 for the featured Wish List idea in each issue. $10 for others published. All ideas published will be credited to the submitter and become the property of PC. In case of duplicate submissions, any award will go to the earliest postmark. Send a description or sketch of your idea to: Wish List, PC, One Park Ave., New York, NY 10016. Sorry, we can't discuss the Wish List feature by telephone.

Illustration: Frank Marciuliano

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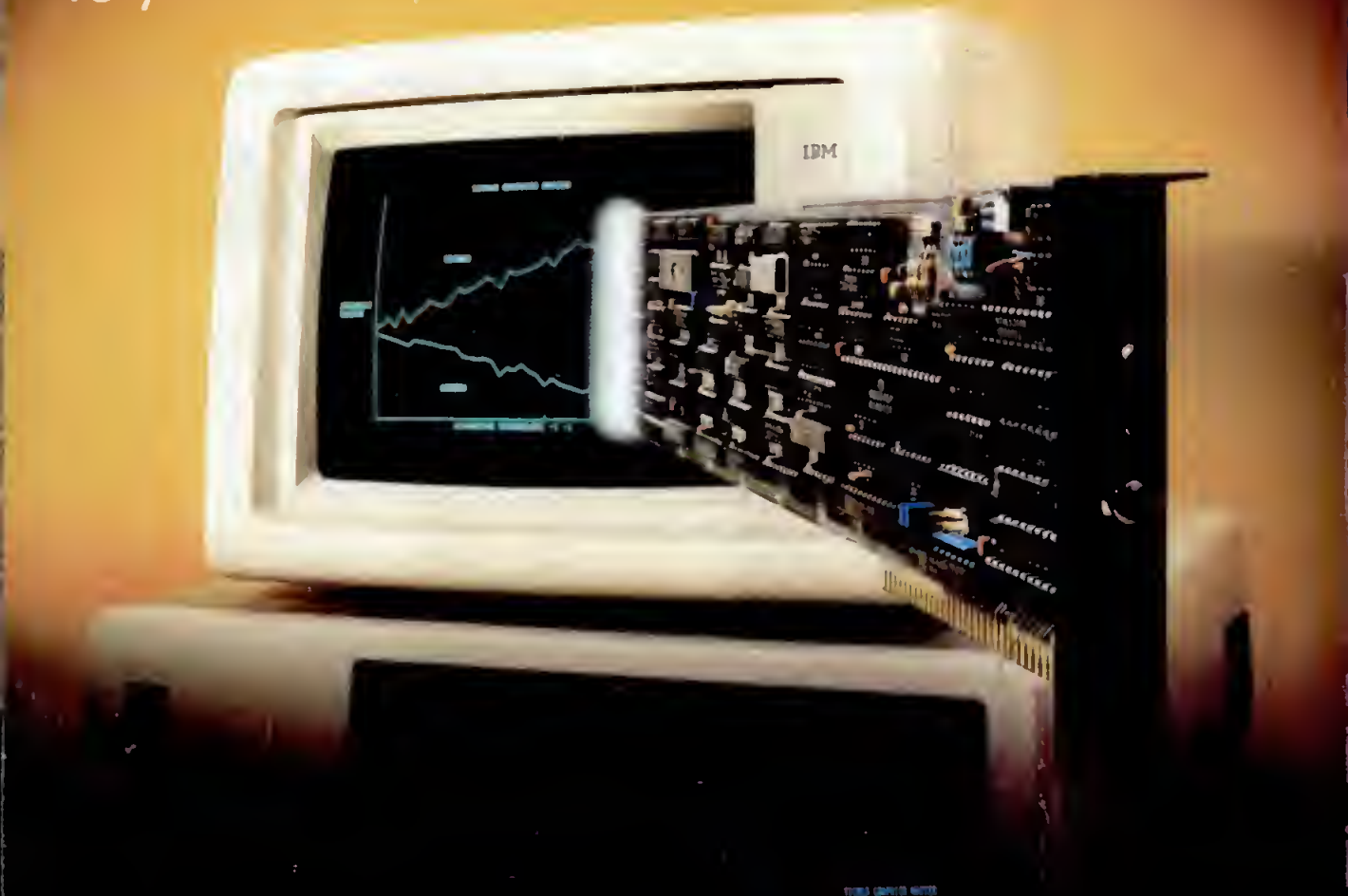

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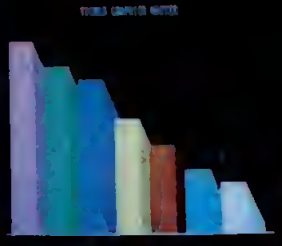

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